



*Illustrated catalogue of electric  
light and power supplies*

Electrical Supply Co

---

This is a reproduction of a library book that was digitized by Google as part of an ongoing effort to preserve the information in books and make it universally accessible.

Google<sup>TM</sup> books

<https://books.google.com>





Eng 3999.11



Harvard College Library

*Transferred*  
FROM

*Engineering Library*











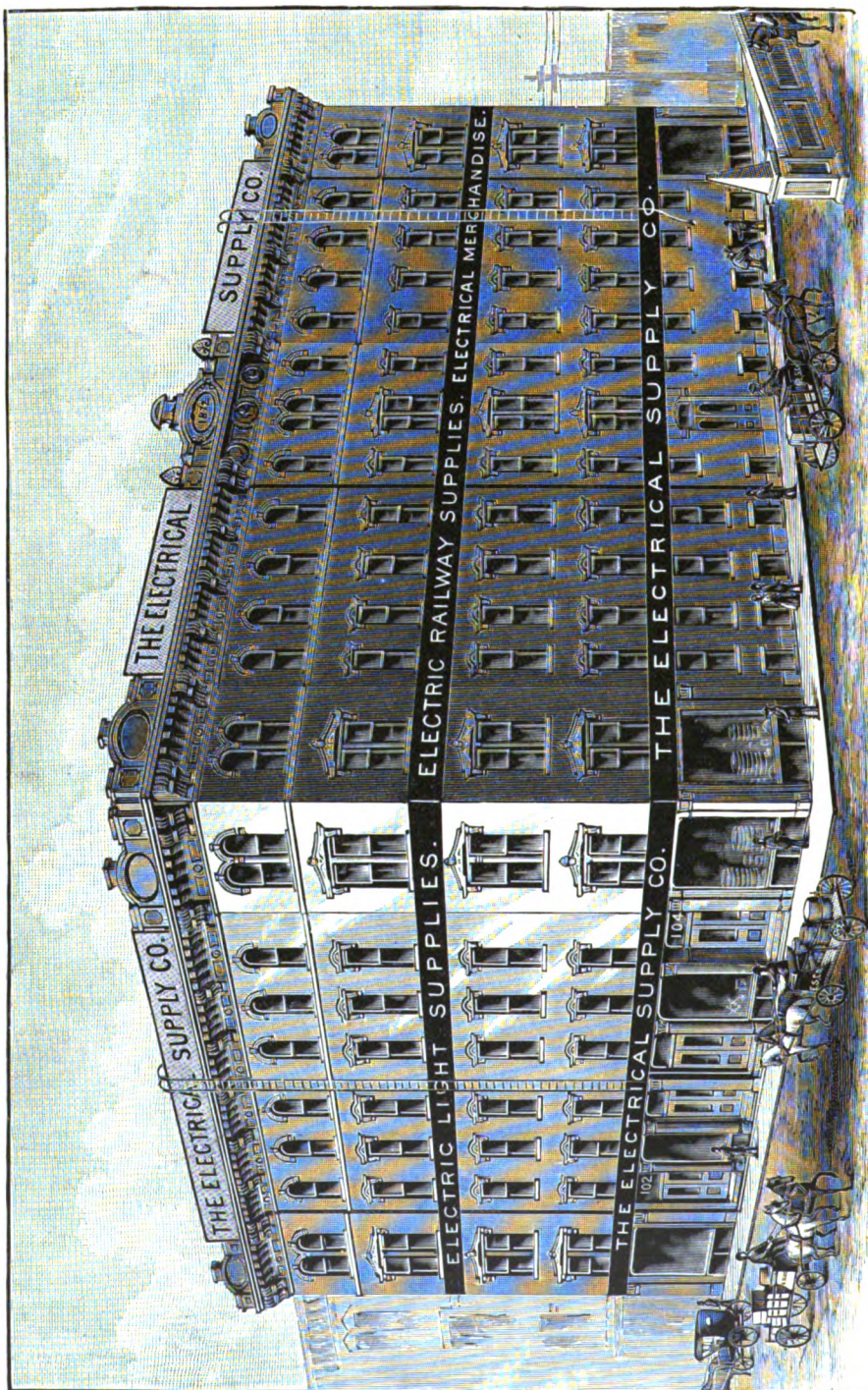


## ALL RIGHTS RESERVED.

---

**WE** CALL particular attention to the fact that this Catalogue has been copyrighted, and that we shall fully protect our rights. Legal decisions, rendered in relation to copyright, show that the copyrighting of a catalogue is intended not only to give protection to classifications, tables, directions, and general information, whether considered singly or collectively, but also to prevent illustrations contained therein from being deliberately copied by photographic or other processes where the original sources are not resorted to in procuring such illustrations.

THE ELECTRICAL SUPPLY CO.'S WAREHOUSE, Randolph St. and Michigan Ave., CHICAGO.



OCCUPIED IN JULY, 1891.

No. 23.  
THIRD EDITION.

ILLUSTRATED  
CATALOGUE OF

# Electric Light AND Power Supplies.

THE  
ELECTRICAL  
SUPPLY CO.,

Cor. Randolph Street and Michigan Ave.

(Formerly 171 Randolph Street),

CHICAGO.

EASTERN OFFICE AND FACTORIES,  
ANSONIA, CONN.

Copyrighted, 1892.  
By The Electrical Supply Co.  
Chicago.

Branch Office,  
244 ARCH STREET,  
PHILADELPHIA.

MARCH, 1892.

**JUN 20 1917**  
**TRANSFERRED TO**  
**MAYNARD COLLEGE LIBRARY**

## THE ELECTRIC LIGHT

## AND POWER DEPARTMENT NO. 2,

**I**S separately organized and devoted exclusively to giving particular attention to such goods as are used in electric light and power work. A special department, in charge of one whose wide experience renders him familiar with every detail of the business, is better adapted to the careful observance of orders than the meager attention which is often incidental to a general organization.

## PREFACE.

In presenting our third regular catalogue, devoted particularly to the exposition of electric light and power supplies, we desire to call attention to its completeness as a whole, as well as to express the hope that it will not only demonstrate the same care in compilation as our previous editions, but will also bear evidence to the fact that we have endeavored to keep fully up to the times, while perhaps it may be observed that in some things we are in advance of them. *We have not blindly copied from other trade publications*, but on each and every article described in this catalogue we have brought to bear a careful and expert examination and study, and by this means we have been enabled to winnow from its pages all such articles as did not seem to add to the value of our catalogue as a whole. We feel that the illustrations are deserving of special mention, as they have been prepared with unusual care, the better to picture the goods exactly as they are. Each article in the catalogue will be found fully illustrated, as we believe a correct representation is just as effective and perhaps more satisfactory than lengthy printed descriptions.

Since the publication of our last catalogue we have added to our organization a completely equipped Electrical Engineering Department, and all new articles before they are regularly added to our line are carefully investigated, and must bear the stamp of approval of the head of this department. We hope that our efforts in this direction will be the means of still further raising the standard of our goods, and will enable us to make the broad claim, without fear of contradiction, that our goods are of the highest grade obtainable.

We have recently moved into a large and well-appointed building in Chicago, which, we believe, will still better enable us to improve our facilities for the rapid and careful transaction of our business. Our extensive manufacturing facilities in Ansonia, Conn., and in Chicago, make it possible for us to offer unusual advantages to all classes of electrical buyers.

Each department of our organization has been carefully systematized and brought to the highest possible point of excellence. We have spared neither pains nor expense in the way of increasing such facilities as would add to the advantage we could offer to our customers in placing their orders with us. All of our departments working in collaboration with one another emphasizes the fact that in placing their orders with us our customers may rest assured that their interests are being carefully considered with the least possible delay or chance for errors.

We feel grateful for favors shown us in the past, and thank our friends, in advance, for the further support which we trust they will find it to their advantage to confer upon us in the future.

F. S. TERRY, Manager.

## PURCHASERS PLEASE NOTE.

1. **FINANCIAL RESPONSIBILITY**—If you are not *sure* that your financial standing is known to us, please see that your first order, if not accompanied by *cash*, or authority to draw with bill of lading, is accompanied by satisfactory references, and as much information as you think we are entitled to under the circumstances; otherwise there will be a delay in shipping. *as we will fill no orders from parties entirely unknown to us.* Treat us as you would like us to treat you if you were the seller and we the buyers.

2. **TERMS**—Accounts not otherwise agreed upon are payable 30 days from date of invoice; monthly accounts on the 15th of each following month. Bills and accounts not promptly paid, as above, are subject to *sight draft*, without notice. Where time is extended longer than 30 days, bills must be closed by *acceptances* at time of shipment. *Interest* will be charged on all accounts.

3. **HOW TO REMIT**—Remit by draft, postal note, money order, registered letter, or express money order. We are not responsible for currency lost through the mail.

4. **C. O. D.** orders received from persons unknown to us must be accompanied by a sufficient amount to pay transportation charges both ways.

5. **MAIL**—Goods forwarded by mail, when so ordered, are at the risk of purchaser. We will register parcels when desired, charging cost of registration.

6. **HOW TO SHIP**—State whether shipment is desired by freight or express; and if there is any preference, give name of route.

7. **CASING AND CARTAGE**—A moderate charge for casing and cartage will in all instances be made.

8. **LOSS IN TRANSIT**—We exercise the greatest care in packing, and obtain receipts for all goods forwarded "in good condition." If there is any damage in transit, make prompt claim on the Railroad or Express Company, and write us, explaining the nature of the damage and amount of claim made. We can not hold ourselves responsible for breakage or loss sustained in transit, but are anxious to have all claims adjusted to the satisfaction of our customers.

9. **HOW TO ORDER**—Parties ordering will facilitate prompt shipment by using *our catalogue numbers*. Devote a separate line to each article ordered. When orders are given us from quotations we have sent, the date of the letter should always be given, as this will enable us to avoid possible errors in filling the orders. As orders, remittances, and requests for quotations are each referred to separate departments for attention, it will insure promptness if each is sent us on a separate sheet. These requests are made as much in our customers' interests as our own. We are glad to receive orders in any form and will fill them to the best of our ability. Orders for goods "same as last" are liable to delay.

10. **RETURNING GOODS**—The greatest possible care will be taken to fill orders promptly and correctly. If orders are not perfectly clear we will write for fuller description, but when they are filled with the goods called for, same can not be returned without special agreement.

11. **ORDERING WIRE**—In ordering Wire state number and gauge. Where gauge is not mentioned we shall understand that Wire by Brown & Sharpe's American Standard Wire Gauge is wanted.

12. **CLAIMS FOR ERRORS**—All claims for allowances should be made promptly upon receipt of goods. *We hold ourselves in readiness, however, to correct errors at any time.*

13. **PRICES**—All former prices and lists are hereby annulled. All prices are subject to change without notice.

14. **ELECTROTYPES**—*We must positively decline to lend or sell any electrotypes. Please do not ask it.*

## INSULATED WIRES,

## CABLES, AND CORDS.

In connection with this we desire first to call attention to the fact that we are manufacturers of a large class of the goods shown in this department. Our Insulated Wire Factory at Ansonia, Conn., was established more than eleven years ago, and was one of the first, as it has always been one of the largest, wire factories in the country. Our Shield Brand Moisture-proof Wires, our P. & B. Weather-proof Wires, our Magnet Wires, and others of a similar class are manufactured by ourselves, which gives us unusual advantages in naming the lowest possible prices consistent with the quality we furnish, for, in wires, as in other goods, it is our endeavor to have the quality a little better than that sold by others.

We are General Western Agents for the Habirshaw Rubber Insulation, which has now been on the market for a number of years, and has been used without a single failure in the most difficult installations. Those who have taken the trouble to carefully investigate, by actual tests, the merits of the different rubber wires have, without exception, so far as we know, found the Habirshaw Insulation to be superior to all others. We feel assured that in the acquisition of the Habirshaw Rubber Insulation we have consummated a most important and satisfactory arrangement for our entire line.

## SHIELD BRAND MOISTURE-PROOF INSULATION.

Manufactured by E. S. Co. under special process.



SHIELD BRAND INSULATION has been on the market for nearly three years. From the first it was recognized as a superior quality of compound insulation, and since then it has been constantly improved. Recently, as a result of extensive and careful experimenting, a new process of manufacture was perfected, which enables us to produce an insulation superior to anything we were able to manufacture by our former methods, which were similar to those in general use. In insulation resistance, Shield Brand occupies a position between weather-proof and rubber insulations. As our Shield Brand Moisture-proof Wire is sometimes confused with Weather-proof Wires, we will explain what we understand to be the difference :

*Weather-proof Insulation.*—An insulation to be truly weather-proof should neither crack in cold nor soften in heat. The insulating compound should not disintegrate nor deteriorate, in any degree, by exposure to the elements.

*Moisture-proof Insulation* should possess all of the weather proof qualities, and, in addition, the cotton fabric used in the insulation should be so treated as to prevent moisture from being drawn in by capillary attraction, which directly reduces the insulation resistance. An electric circuit constructed with Moisture-proof Insulated Wire should have nearly, if not quite, as high an insulation resistance in wet weather as in dry. This is not true of any "weather-proof" wires.

Shield Brand Insulation is thoroughly saturated with our compound, which firmly adheres to the bare wire, while the insulation, as a whole, is unusually tough and designed to resist abrasion. The insulation is made in two grades: The *regular*, which is suitable for all ordinary line work, and the *special*, which is extra heavy and intended for use under unusually difficult conditions, particularly where there is more than ordinary liability to abrasion.

**SHIELD BRAND MOISTURE-PROOF** should not be confused with "Weather-proof" Insulations.

## SHIELD BRAND MOISTURE-PROOF INSULATION

*Continued.*

## REGULAR INSULATION.



Trade No. 44.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,950 lbs.	748 lbs.	\$0.45	5	705 lbs.	134 lbs.	\$0.44
000	3,285 "	622 "	.45	6	600 "	114 "	.44
00	2,555 "	484 "	.44	8	445 "	84 "	.45
0	2,090 "	396 "	.44	10	255 "	49 "	.48
1	1,620 "	307 "	.44	12	170 "	32 "	.50
2	1,280 "	242 "	.44	14	110 "	21 "	.52
3	1,015 "	192 "	.44	16	70 "	13 "	.54
4	860 "	163 "	.44	18	60 "	11 "	.58

## SPECIAL INSULATION.



Trade No. 45.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	4,142 lbs.	784 lbs.	\$0.47	3	1,073 lbs.	203 lbs.	\$0.46
000	3,487 "	660 "	.47	4	924 "	175 "	.46
00	2,699 "	511 "	.46	5	764 "	144 "	.46
0	2,225 "	421 "	.46	6	660 "	125 "	.46
1	1,715 "	324 "	.46	8	505 "	95 "	.47
2	1,353 "	256 "	.46				

A large stock of all sizes of the Regular Insulation (No. 44) is carried in Chicago. The Special Insulation (No. 45) will be shipped from our factory, and promptness in filling orders may be relied upon.

Furnished either on reels or in coils.

Our trade mark (registered) is placed on the tag attached to each coil of wire. None genuine without it.

SHIELD BRAND MOISTURE-PROOF should not be confused with "Weather-proof" Insulations.

# SHIELD BRAND MOISTURE-PROOF INSULATION

*Continued.*



## STRANDED CONDUCTORS.

Trade No.	Number of Wires.	Size of Wires.	Equivalent in Carrying Capacity.	Approximate Weight per 1,000 Feet.	Approximate Weight per Mile.	Price per Pound.
181	49	14	0000 B. & S.	753 lbs.	3,975 lbs.	\$0.50
182	41	14	000 "	587 "	3,099 "	.50
183	42	15	00 "	465 "	2,455 "	.50
191	39	16	0 "	385 "	1,927 "	.50
194	49	21	4 "	153 "	808 "	.60
176	7	14	6 "	115 "	607 "	.50
186	21	19	6 "	118 "	623 "	.55
196	49	23	6 "	120 "	634 "	.65
198	49	25	8 "	74 "	391 "	.65
170	28	25	10 "	82 "	169 "	.65

Larger Sizes to Order.

# SHIELD BRAND HARD DRAWN COPPER WIRE.

## Trade No. 48.

No. 10 B. & S.	Price per pound, \$0.48
" 12 "	" " .50
" 14 "	" " .52
" 16 "	" " .54

# SHIELD BRAND PRESSURE WIRE.

FOR USE IN INCANDESCENT WORK.

## Trade No. 49.

Extra B. B. Galvanized Iron Wire covered with Shield Brand Insulation.

No. 10 W. & M. Gauge, (No. 7½ B. & S.)	per pound, \$0.22
" 12 " " 10 "	" " .28
" 14 " " 12 "	" " .37

SHIELD BRAND MOISTURE-PROOF should not be confused with "Weather-proof" Insulations.

# SHIELD BRAND MOISTURE-PROOF INSULATION

*Continued.*

"SHIELD BRAND" WAS ALWAYS GOOD.

PIQUA, OHIO, December 9, 1890.

*The Electrical Supply Co., Chicago, Illinois.*

GENTLEMEN: Replying to your letter of the 2nd inst. in regard to "Shield Brand." We have had about thirty miles of three braid "Shield" in use for over a year, and consider it to be the best line wire we can get.

Yours truly,

PIQUA ELECTRIC LIGHT & POWER CO.,

By H. B. BROOKS, Supt.

CONCORD, N. H.

*The Electrical Supply Co., Chicago, Illinois.*

GENTLEMEN: Would say that we have between twelve and fourteen miles of two and three-braid Shield Brand in use here, running through trees, and bad ones at that, and it has given perfect satisfaction thus far, after being in use two years.

W. A. RICHMOND, Supt. Electrical Dept.,

Concord Gas Light Co., Concord, N. H.

BUT IS NOW EVEN BETTER.

Test of fifty feet of SHIELD BRAND WIRE made at the Electric Light Station of the Derby Gas Company, Birmingham, Conn., as follows:

I took fifty feet of SHIELD BRAND WIRE and wound it with a strip of bare copper wire, to make perfect connections with same; then this was immersed in rain water for twenty-eight hours; then a sensitive galvanometer was placed in the circuit and a current from a Thomson-Houston Dynamo of 2570 volts was put through it, and there was not the least deflection of the galvanometer visible.

A Weston High Resistance Voltmeter was used to measure the current.

(Signed) CHARLES LEVIN,

E. E.

[L. s.]

I hereby certify that I was present during all the time that the above test was being made, and that the above is a true and correct description of the test made, in all respects.

[L. s.]

(Signed)

ROBERT E. WYANT,

Supt. Electric Light Station.

State of Connecticut, }  
County of New Haven. }

Before me, the undersigned, a Notary Public in and for said county, personally appeared Charles Levin and Robert E. Wyant, known to me to be an Electrical Engineer and Superintendent of the Electric Light Station, and declared that the above account is just and true, to the best of their knowledge and belief.

Sworn and subscribed to this 20th day of July, A. D. 1891.

[L. s.]

(Signed)

JOHN E. LEWIS.

## INSULATION RESISTANCE.

We have had made actual tests of the Insulation Resistance with the result given below. These tests, it will be observed, show remarkably high Insulation Resistance for a compound wire, and we could hardly believe the figures to be correct if we had not had them fully verified.

### 50 Feet of Shield Brand Moisture-proof.

At immersion.....	200,000,000 Ohms.
After 24 hours .....	5,000,000 "
" 72 " .....	5,000,000 "
" 120 " .....	4,850,000 "
" one week .....	4,200,000 "

SHIELD BRAND MOISTURE-PROOF should not be confused with "Weather-proof" Insulations.

## P. & B. WEATHER-PROOF LINE WIRE.



P. & B. WEATHER-PROOF INSULATION has been several years on the market, and the test of time has fully verified the claims that we have made for it. This insulation will be found superior to most of those insulations we find in the market under the general name of "Weather-proof."



Trade No. 41.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,739 lbs.	708 lbs.	\$0.42	6	505 lbs.	95 lbs.	\$0.40
000	3,115 "	590 "	.42	7	415 "	78 "	.42
00	2,425 "	459 "	.40	8	344 "	65 "	.42
0	1,895 "	359 "	.40	10	241 "	45 "	.44
1	1,491 "	282 "	.40	12	146 "	27 "	.46
2	1,180 "	223 "	.40	14	100 "	19 "	.48
3	940 "	178 "	.40	16	65 "	12 "	.52
4	758 "	143 "	.40	18	43 "	8 "	.56
5	620 "	117 "	.40				

Our trade-mark (registered) is placed on all tags of "P. & B." Weather-proof Line Wire. None genuine without it.

## UNDERWRITERS LINE WIRE.

SOLID CONDUCTOR.



Trade No. 39.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,960 lbs.	750 lbs.	\$0.42	6	575 lbs.	109 lbs.	\$0.40
000	2,957 "	560 "	.42	8	390 "	74 "	.43
00	2,600 "	492 "	.40	9	300 "	57 "	.44
0	1,990 "	376 "	.40	10	285 "	54 "	.44
1	1,600 "	303 "	.40	12	180 "	35 "	.46
2	1,270 "	241 "	.40	14	110 "	21 "	.48
3	1,025 "	195 "	.40	16	74 "	14 "	.52
4	880 "	167 "	.40	18	64 "	12 "	.56
5	720 "	136 "	.40				

## UNDERWRITERS INSULATION.

STRANDED CONDUCTOR.



Trade No.	Number of Wires.	Size of Wires.	Equivalent in Carrying Capacity.	Approximate Weight per 100 Feet.	Price per Pound.
104	7	12	4 B. & S.	18 lbs.	\$0.35
114	21	17	4 "	17 "	.35
107	26	18	4 "	17 "	.36
105	7	13	5 "	15 "	.35
115	21	18	5 "	14 "	.36
109	6	18	10 "	5 "	.36
111	26	24	10 "	5 "	.37



The E. S. Co., Western Agents.

### A HIGH GRADE OF RUBBER INSULATION.

Pure India Rubber is the highest known insulation, and when not mixed with inferior adulterations, will be found to have an unusually long life. The high price of India Rubber covered" **H** has resulted in the almost universal use of compositions, consisting of "rubber mixed with cheaper materials, such as oil, wax, paraffine, and Ozokerite, thereby producing an article which, while it may have high insulating properties at first, *shortly loses its life and becomes utterly valueless for insulating purposes.*

It is a fact **A** that in the Habirshaw Insulation, pure Para Rubber is the only organic substance, and it is also a fact that this is not true of most other insulations." The prevailing opinion, that all rubber insulations are about the same in quality, is entirely incorrect. There is a very great difference, not only in the material employed, but in the care exercised in the manufacture as well. The Habirshaw Insulation is the result of the most careful study and the greatest care exercised in the manufacture, combined with an honest intention to produce an article that time would demonstrate what it was claimed to be, viz.: superior to others. The Habirshaw Insulation has been made for more than five years, has been used in the most difficult installations, and has been extensively used by the United States Government for the wiring of new cruisers. All of this is good evidence, in a general way, of the superiority of Habirshaw. We earnestly recommend those using rubber wires in large quantities to make actual comparative tests of the different wires in the market. We would suggest a few simple forms of tests as follows:

**INSULATION RESISTANCE**—The Habirshaw Insulation will be found superior to others in actual Insulation Resistance, but as this is far from being the most important quality it possesses, judgment should not be formed by this test only.

**LIFE TEST**—Remove the outer covering—**R** all braid, paint, etc.—and dissolve the different rubber insulations in chloroform or sweet naphtha, and it can be seen by the sediment whether the insulations contain injurious adulterations or not. While time will not last. While time simple means learn something of the and the probability as to their life. It is well known that insulations with Pure Para Rubber as a basis will last a great many years, while cheaper materials, such as oil, wax, paraffine, and Ozokerite, will not prove so enduring.

**INDUCTION COIL TEST**—Connect the conductor **H** with one pole of an Induction Coil and pass the other over the insulation. If the discharge is uniform, it shows insulation has "bad spots." If the discharge is not uniform, it shows that the insulation must

We realize that the full appreciation of the high quality of Habirshaw Insulation must largely be a matter of time. Cheaper insulations will be bought and failures experienced, before the subject will be given the careful attention that it deserves.

The Habirshaw Standard Insulation, as made and carried **A** by us in stock, is suitable for all ordinary work. Where it is wanted for use under unusually difficult conditions, we should be fully informed of such, as it may be necessary to manufacture a special insulation, or guard the rubber by an outside covering in order to withstand the particularly destructive elements that may be encountered.

Habirshaw Insulation may be used in plaster, and will be found satisfactory in breweries, paper mills, packing houses, malt houses, soap factories, foundries, mines etc.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION.

STANDARD.



Solid Conductors—Taped.

H. 150.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.
	B. & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
T 184	18	4	2½	T 412	4	12	15½
T 166	16	6	2¾	T 313	3	13	18
T 146	14	6	3½	T 214	2	14	23½
T 127	12	7	4½	T 114	1	14	31½
T 108	10	8	6½	T 015	0	15	41
T 810	8	10	8½	T 00	00	21	55
T 610	6	10	11½	T 000	000	22	63
T 510	5	10	13½	T 0000	0000	23	80

# HABIRSHAW INDIA-RUBBER INSULATION.

STANDARD.



Solid Conductors—Braided.

H. 151.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.
	B & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
B 184	18	4	2¾	B 412	4	12	16
B 166	16	6	3	B 313	3	13	18½
B 146	14	6	3¾	B 214	2	14	24½
B 127	12	7	5	B 114	1	14	32½
B 108	10	8	6½	B 015	0	15	43
B 810	8	10	8½	B 00	00	21	57
B 610	6	10	12	B 000	000	22	65
B 510	5	10	14	B0000	0000	23	85

We carry in stock all sizes colored, and Nos. 12, 14, and 16 white.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

FLAME-PROOF.



Solid Conductor—Braided.

H. 152.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.
	B. & S.				B. & S.		
F. P. 184	18	4	2½	F. P. 412	4	12	16
F. P. 166	16	6	3	F. P. 318	8	18	18½
F. P. 146	14	6	3½	F. P. 214	2	14	24½
F. P. 127	12	7	5	F. P. 114	1	14	32½
F. P. 108	10	8	6½	F. P. 015	0	15	43
F. P. 810	8	10	8½	F. P. 00	00	21	57
F. P. 610	6	10	12	F. P. 000	000	22	65
F. P. 510	5	10	14	F. P. 0000	0000	23	85

The above is treated to make it non-inflammable. Our stock consists of colored, but white can be furnished when ordered.

# HABIRSHAW INDIA-RUBBER INSULATION.

STANDARD.



Stranded Conductors—Braided.

H. 154.

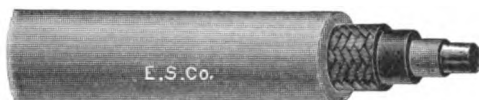
Trade No.	Gauge.	Strands.	M	Approx. Outside Diameter.	Price per Foot.
	B. & S.				
		Size of Wire.	Cir. Mils.	32ds.	Cents.
S. B. 718	8	7-18 B.W.G.	16,807	12	10½
S. B. 716	6	7-16 "	29,575	14½	17½
S. B. 715	5	7-15 "	36,328	14½	19½
S. B. 714	4	7-14 "	48,223	15½	24½
S. B. 711	3	7-11 B.&S.	57,638	16½	29½
S. B. 1917	2	19-17 B.W.G.	63,916	17	32½
S. B. 1916	1	19-16 "	80,275	16½	36
S. B. 1915	0	19-15 "	101,000	19½	47½
S. B. 1914	00	19-14 "	130,891	21½	60
S. B. 1911	000	19-11 B.&S.	156,446	22½	68
S. B. 1912	0000	19-12 B.W.G.	225,739	23½	88

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

## STANDARD—LEAD ENCASED.



Gauge, B. & S.	Thickness of Lead, 4-32 of an inch.		Thickness of Lead, 2-32 of an inch.		Thickness of Lead, 1-32 of an inch.	
	Trade No.	Price per ft.	Trade No.	Price per ft.	Trade No.	Price per ft.
18	1844 L	\$0.08 $\frac{1}{2}$	1842 L	\$0.05 $\frac{3}{4}$	1841 L	\$0.04 $\frac{1}{2}$
16	1664 L	.09 $\frac{1}{2}$	1662 L	.06 $\frac{1}{2}$	1661 L	.04 $\frac{1}{2}$
14	1464 L	.11 $\frac{1}{2}$	1462 L	.08	1461 L	.06
12	1274 L	.13	1272 L	.09	1271 L	.07
10	1084 L	.16	1082 L	.11 $\frac{1}{2}$	1081 L	.09
8	8104 L	.19	8102 L	.14		
6	6104 L	.25	6102 L	.18 $\frac{1}{2}$		
5	5104 L	.28 $\frac{1}{2}$	5102 L	.21		
4	4124 L	.30 $\frac{1}{2}$	4122 L	.23		
3	3134 L	.35 $\frac{1}{2}$	3132 L	.27		
2	2144 L	.42 $\frac{1}{2}$	2142 L	.33 $\frac{1}{2}$		
1	1144 L	.52	1142 L	.42		
0	0154 L	.62	0152 L	.53		
00	004 L	.80	002 L	.69		
000	0004 L	.90	0002 L	.78		
0000	00004 L	1.12	00002 L	.99		

## AMAZITE BRAND.

### BLACK CORE INSULATION—BRAIDED.



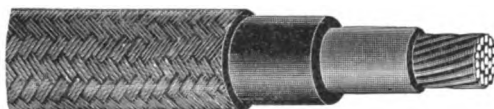
Gauge, B. & S.	Price per 1,000 ft.	Gauge, B. & S.	Price per 1,000 ft.
18	\$ 20.00	4	\$116.75
16	21.25	3	146.00
14	25.50	2	168.00
12	39.50	1	218.00
10	48.50	0	340.00
8	57.75	00	468.00
6	79.00	000	547.00
5	108.25	0000	700.00

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

**HABIRSHAW INDIA-RUBBER INSULATION—Continued.****NAVAL LAND CORES.****Solid Conductors. Extra Heavy Insulation.**

H. 101.

Trade No.	Gauge.	Gauge.	Diameter of Copper.	Diameter of Insulation.	Approximate Outside Diameter Taped.	Price per Foot.
	B. W. G.	B. & S.	.001	.001	82ds.	Cents.
18237	18	16	.049	.237	8½	6
17246	17	15	.058	.246	8½	6½
16253	16	14	.065	.253	9	7
15260	15	13	.072	.260	9½	7½
14271	14	12	.083	.271	9½	8½
13283	13	10-11	.095	.283	10	9½
12297	12	9-10	.109	.297	10½	10½
11308	11	8-9	.120	.308	10½	11½
10322	10	7-8	.134	.322	11½	12½
9336	9	6-7	.148	.336	11½	14
8353	8	6	.165	.353	12	15½
7368	7	5	.180	.368	12½	17½
6391	6	4	.203	.391	13½	20½
5408	5	3-4	.220	.408	14	22½
4426	4	2-3	.238	.426	14½	24½
3447	3	2	.259	.447	15½	27½
2472	2	1	.284	.472	16	31
1488	1	1-0	.300	.488	16½	36½
0528	0	0-00	.340	.528	18	44

**NAVAL LAND CORES.****Stranded Conductors. Extra Heavy Insulation.**

H. 102.

Circular Mils.	Strands.	Lbs. Copper per 1,000 Feet.	Outside Diameter Strands.	Outside Diameter Insulation.	Price per Foot.
			.001	.001	Cents.
4498	7	13.58	.076	.2635	9½
5488	7	16.00	.084	.2715	10½
8575	7	25.97	.105	.2925	11½
11368	7	34.45	.1209	.3085	13
16807	7	50.90	.147	.3345	15½
18100	7	54.81	.1524	.3390	16
22796	7	69.07	.171	.3585	18½
23548	7	71.35	.174	.3615	18½
29575	7	91.80	.195	.3825	21
36328	7	109.94	.216	.4035	26
45619	19	140.70	.245	.4325	31½
48223	7	146.11	.246	.4335	31½
63916	19	200.00	.290	.4775	35½
80275	19	246.00	.325	.5125	40
88837	37	270.00	.343	.5305	41½
101000	19	304.00	.360	.5475	50½
124468	37	387.00	.406	.5935	53
156325	37	485.00	.455	.6425	65½

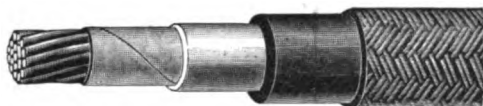
The insulation of the Naval Land Cores is extra heavy, and is especially designed for difficult installations where a high grade of insulation is demanded. These Cores are not carried regularly in stock, but will be furnished on very short notice.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

## NAVAL MARINE CORES.



Stranded Conductors—Extra Heavy Insulation.

H. 108.

Circular Mils.	Strands.	Lbs. Copper per 1,000 Feet.	Outside Diameter Strands.	Outside Diameter Insulation.	
			.001	.001	
4498	7	13.58	.076	.2635	11½
5488	7	16.00	.084	.2715	12½
8575	7	25.97	.105	.2925	12½
11368	7	34.45	.1209	.3085	14
16807	7	50.90	.147	.3345	18
18100	7	54.81	.1524	.3390	18½
22796	7	69.07	.171	.3585	21
28548	7	71.35	.174	.3615	21½
29575	7	91.80	.195	.3825	24
36828	7	109.94	.216	.4035	30
45619	19	140.70	.245	.4325	36½
48223	7	146.11	.246	.4385	37
63916	19	200.00	.290	.4775	40½
80275	19	246.00	.325	.5125	46½
88837	37	270.00	.343	.5305	49
101000	19	304.00	.360	.5475	58½
124468	37	387.00	.406	.5935	59½
156325	37	485.00	.455	.6425	73½

These Cores are serviceable for under-water and mining work, as well as for the most difficult conditions to be met with in construction. These Cores are not carried regularly in stock, but will be furnished on very short notice.

# HABIRSHAW INDIA-RUBBER INSULATION.

## SWITCH-BOARD CABLES.



Very Flexible.

H. 109.

Trade No.	Gauge No.	(M)	Price per Foot.	Trade No.	Gauge No.	(M)	Price per Foot.
		Circular Mils.	Cents.			Circular Mils.	Cents.
H 300	8 B. & S.	16500	17	H 304	8 B. & S.	52634	30½
H 301	6 "	26250	19	H 308	Special Dy- namo Cord, 61-24	29524	30½
H 302	5 "	33102	20				
H 303	4 "	41742	24				

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

**HABIRSHAW INDIA-RUBBER INSULATION—Continued.**

TAPED FIXTURE WIRE.



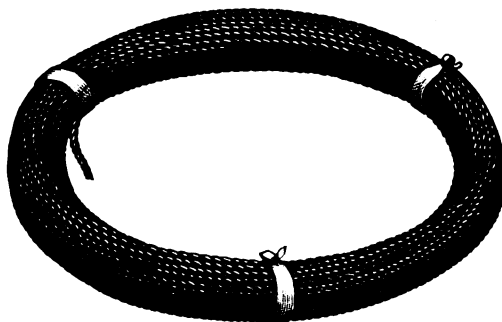
H. 108.

SINGLE CONDUCTOR.			DOUBLE CONDUCTOR.		
Trade No.	Gauge.	Price per Foot.	Trade No.	Gauge.	Price per Foot.
	B. & S.	Cents.		B. & S.	Cents.
200	18	2 $\frac{5}{8}$	201	18	3 $\frac{3}{4}$
202	16	3	203	16	5 $\frac{3}{4}$
204	14	3 $\frac{3}{4}$	205	14	6 $\frac{3}{4}$

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

**HABIRSHAW INDIA-RUBBER INSULATION.**

INCANDESCENT LAMP CORD.

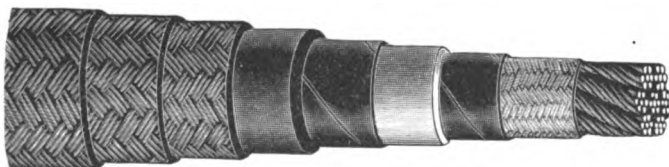


H 110.

COTTON.				SILK.			
Trade No.	Gauge.	Strand.	Price per Foot.	Trade No.	Gauge.	Strand.	Price per Foot.
	B. & S.		Cents.		B. & S.		Cents.
C 400	22	6-30 B. W. G.	5	S 400	22	6-30 B. G. W.	6
C 401	20	8-30 "	5 $\frac{1}{2}$	S 401	20	8-30 "	7
C 402	18	12-30 "	8	S 402	18	12-30 "	9 $\frac{1}{2}$
C 403	16	19-30 "	11 $\frac{1}{2}$	S 403	16	19-30 "	13 $\frac{1}{2}$
C 404	14	29-30 "	14	S 404	14	29-30 "	16 $\frac{1}{2}$
C 405	12	46-30 "	16 $\frac{1}{2}$	S 405	12	46-30 "	20 $\frac{1}{2}$

**HABIRSHAW INDIA-RUBBER COVERED.**

SPECIAL MINING CORE.



This is a tough and very superior insulation, made especially to withstand the difficulties encountered in mining work. The insulation is not so heavy or clumsy as many other cores, but owing to its superior mechanical construction is more serviceable. It is unsurpassed for mine work when natural gas and hydrocarbon oils are not encountered.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

## HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

### SPECIAL CORES.

We make a specialty of furnishing large Habirshaw Cores to fulfill unusual and difficult conditions of installation. Of the quality of the Cores furnished, we can assure our customers that they are manufactured in the most scientific and painstaking manner, and that every precaution is taken to guard against every possible difficulty that may arise. Special attention is called to the uniformity and exact dimensions of the large Cores, as evidencing the care with which they are manufactured. A large number of the special Cores have been made during the past five years, and that *there have been no failures* is the strongest confirmation of our claim to superiority. We can aver, without fear of contradiction, that no other manufacturer of heavy rubber Cores has given equal attention to this branch of his product.

No list prices can be given, as the Cores are made especially to suit given conditions, which radically differ in each case, but we shall be pleased to quote prices upon receipt of information as to requirements. In the following pages we illustrate a few of the large Cores that have been furnished. In the illustrations given, we have referred to the large Cores of from one hundred thousand to one million circular mils.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

## SPECIAL CORES.

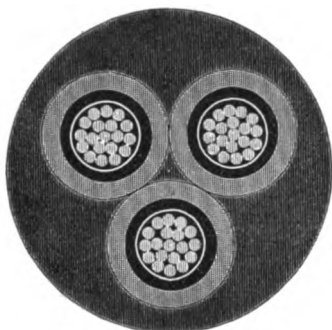


Fig. 1.



Fig. 2.

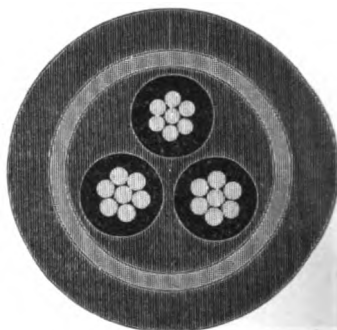


Fig. 3.



Fig. 4.

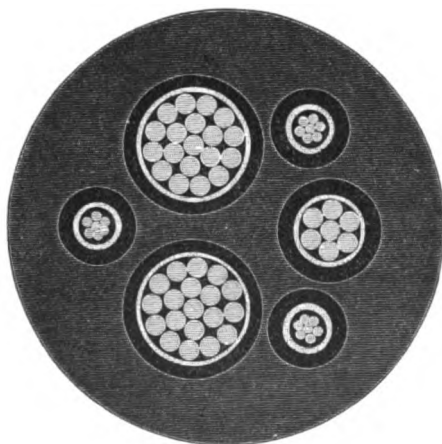


Fig. 5.

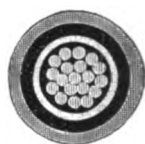


Fig. 6.

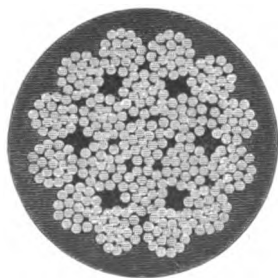


Fig. 8.

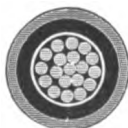


Fig. 7.

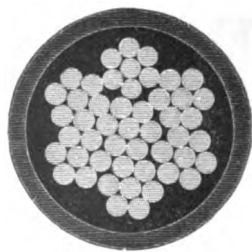


Fig. 9.

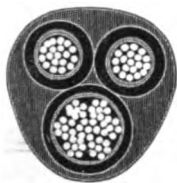
For description see pages 22 and 23.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

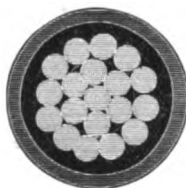
# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

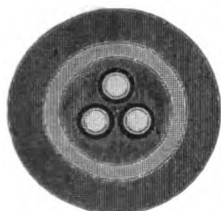
## SPECIAL CORES.



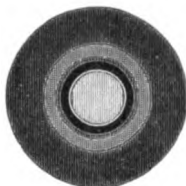
**Fig. 10.**



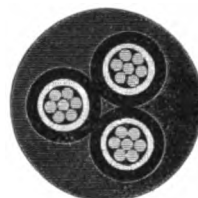
**Fig. 11.**



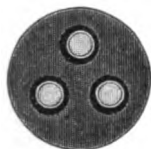
**Fig. 12.**



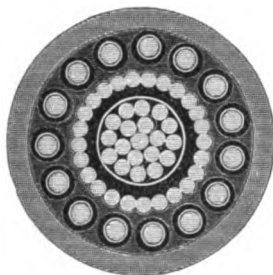
**Fig. 13.**



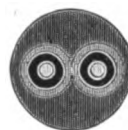
**Fig. 14.**



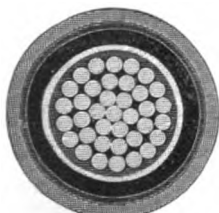
**Fig. 15.**



**Fig. 16.**



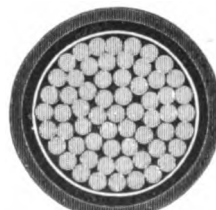
**Fig. 17.**



**Fig. 18.**



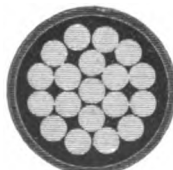
**Fig. 19.**



**Fig. 20.**



**Fig. 21.**



**Fig. 22.**

For description see pages 22 and 23.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

## SPECIAL CORES.

### DESCRIPTION.

**Figure 1.**—Feeder Core. Three circuit. Outside diameter 1 12-16 inches. 120,000 circular mils. Insulated with rubber and leaded.

This class of Core is furnished from 20,000 to 150,000 circular mils, and is similar to those furnished the Brooklyn Edison Co., Brooklyn, New York, and the Edison Illuminating Co., New York.

**Figure 2.**—Land Core, leaded. Outside diameter 9-16 inches. Used in the Interior Department, Washington. Brush Incandescent Installation.

**Figure 3.**—Feeder Core. Three circuit. Outside diameter 1 12-16 inches. 120,000 circular mils.

The construction is similar to Figure 1 with the exception that the lead protection is placed around all three strands together instead of each one separately. This particular Core was used by the Brooklyn Edison Electric Light Company.

**Figure 4.**—Dynamo Feeders and general service. Outside diameter 12-16 inches. These Cores are made in all sizes.

**Figure 5.**—For Submarine work. Outside diameter 2 5-16 inches. 450,000 circular mils. This has no lead protection or outside armoring, but instead is covered with jute, which is now largely used in the telegraph service in Europe, and is found to wear better and give better protection. Being more flexible it protects the cable from being broken and pulled apart. This particular Core was used by the Edison Electric Light Co., Easton, Pa., to lay across the Delaware River.

**Figure 6.**—Marine Core. Outside diameter 12-16 inches. Habirshaw Insulation, lead covered. This Core is used on all of the Government Cruisers.

**Figure 7.**—Land Core, leaded. Outside diameter 10-16 inches. Conductor composed of 19 No. 16 B. W. G. Wires.

This particular Core was used in the installation of the Steamer Puritan.

**Figure 8.**—Feeder Cable. Outside diameter 1 7-16 inches. 700,000 circular mils. Composed of 361 No. 17 B. & S. Wires.

This particular Cable was used for ducts in the streets by the Brooklyn Edison Electric Light Co., Brooklyn, New York.

**Figure 9.**—Feeder Cable. Outside diameter 1 5-16 inches. 500,000 circular mils. Habirshaw Insulation.

This style of Feeder Cable was used in the Brooklyn Edison Electric Light Station, New York.

**Figure 10.**—Feeder Conductor for dry places. Three circuit. Outside diameter 14-16 inches. 120,000 circular mils.

A Conductor similar to this was used in the Grand Central Depot Installation, New York.

**Figure 11.**—Feeder Conductor. Outside diameter 15-16 inches. 300,000 circular mils.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

## SPECIAL CORES.

### DESCRIPTION.

**Figure 12.**—Underground Core. Three Conductor. Triangular arrangement. Outside diameter 1 2-16 inches. This Core is incased in lead, and is served with an outside protection.

Used for underground work in the New Jersey Central Railway Depot, opposite New York. Edison Installation.

**Figure 13.**—Underground Core. Outside diameter one inch. Habirshaw Insulation, leaded and lead protected, with an outside serving.

**Figure 14.**—Portable Cable. Three strands. Nos. 7 and 14 B. & S.

This class of cables is used for stage light, scenery light, and other special service in theatres. The outside serving is flame-proof.

The cable illustrated was used in the Broadway Theatre, New York. Edison Installation.

**Figure 15.**—Feeder Cable. Outside diameter 12-16 inches. Habirshaw Insulation, not leaded.

**Figure 16.**—Underground Core. Three circuit. Outside diameter 1 7-16 inches. 250,000 circular mils. Habirshaw Insulation, lead covered.

Used by the Harrisburg Electric Light Co., Harrisburg, Pa., for underground work. Edison Installation.

**Figure 17.**—Underground Core. Two circuit. Composed of two No. 16 B. W. G. Wires. Habirshaw Insulation.

This Conductor was used by the Troy Fire Department.

**Figure 18.**—Naval Core. Lead incased. Outside diameter 1 3-16 inches. 255,000 circular mils.

Core similar to this was used for dynamo leads on all of the new Government Cruisers—San Francisco, Boston, Chicago, Charleston, etc.

**Figure 19.**—Underground Conductor. Outside diameter 13-16 inches. Habirshaw Insulation, not leaded.

Conductor similar to this was used in the installation of the New Jersey Central Railway Depot, opposite New York.

**Figure 20.**—Feeder Core. Outside diameter 1 8-16 inches. 420,000 circular mils. Composed of 61 No. 14 B. W. G. Wires.

Used in the installation of the Broadway Theatre, New York City, New York.

**Figure 21.**—Feeder Conductor. Outside diameter 12-16 inches. Habirshaw Insulation. Outside flame-proof.

Used in the installation of the Mount Morris Electric Light Station, New York.

**Figure 22.**—Feeder Conductor. Outside diameter 15-16 inches. 250,000 circular mils.

This class of goods is furnished from 100,000 to 900,000 circular mils. It is entirely for use in dry places, like well-constructed stations. It is also valuable for running through the station, under sidewalks and ducts to the street to make connections. The insulation will answer every purpose for the uses and conditions above mentioned, but is not intended for underground service.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

## HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

### The Two Principal Sources of Rubber Supply.



Pure Para Rubber Stock.



"Recovered" Rubber Stock.

It is a fact, though not generally known, that the larger part of manufactured rubber goods is made from so-called "recovered rubber," principally from old rubber boots, shoes, rubber hose, rubber springs, packing, etc. Rubber that has been vulcanized is no longer rubber but a chemical compound of sulphur and rubber, and is not capable of being treated or worked as pure rubber. Goods manufactured from "recovered" rubber bear the same relation to goods made from pure rubber that shoddy bears to genuine woolen goods.

The following extracts from a report of analyses and tests on various samples of insulated wire will be of interest in this connection. The authority from which we quote is one well known, and with a reputation second to none. We refer to the samples by letters, in preference to using the trade names:

Sample "A" shows 15 per cent. of a heavy hydro-carbon similar to ozokerite, and assimilating to an article known in Europe as nigrite.

Sample "B" has been made over from "recovered" rubber, or a mixture of "recovered" rubber and oxidized oils.

Sample "C" shows by analysis very nearly 80 per cent. of adulteration, consisting chiefly of oxidized oils. The process is known as "spurting" or "spewed" insulation. (See note below.)

Sample "D." Several samples of this insulation were taken, all of which varied. The composition of the rubber is "way off," being largely made up of a heavy substance similar to white lead. The white layer goes to pieces very rapidly.

Sample "E," HABIRSHAW, is the only one of the samples tested, which, by analysis, shows that pure Para Rubber is the only organic substance used in the insulation.

Sample "F" has about 5 per cent. of resins. It is poorly manufactured, the "spurting" process being used.

Sample "G" is made and built on the same plan as "F," containing a mixture of resins. This insulation is perhaps the poorest made of any, and shows a very imperfect knowledge of manufacture. The "spurting" process is used.

NOTE.—"Spurting" or "spewed" insulation, so far as known, can not be made of pure rubber compound. The only claim that can be made for it is that it produces an insulation which is seamless, *but this condition is obtained at the expense of the quality of the insulating material.* On this question of having a seam, there is only one view to be taken, it is stronger than the other, provided the manufacture is carried on correctly; if not, it is like all other badly made things, "good for nothing."

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

And the Result, as Demonstrated by a Simple Test.



These cuts represent the characteristic results of a qualitative test on the composition of 13 samples of so-called rubber wires. This test was made by removing the outer covering of each sample—all braid, paint, etc.—and then paring off the insulating material and putting in a bottle with naphtha. The action of naphtha on "rubber" wire covering is briefly as follows:

1.—To swell the rubber without dissolving.

2.—By this action to loosen and precipitate mineral impurities and adulterations to some extent.

3.—To dissolve waxes, ozokerites, oil compounds, etc.

This test, while by no means exhaustive, is more instructive and valuable than any single test that can be applied in the laboratory—far more valuable than insulation tests—and when the final rub, the test of time, can not be awaited, it will serve to show the ridiculous pretensions of the makers of many "Best Rubber Wires."

Our samples in the test here illustrated, at the end of three months, included all the well-known gum insulations in the market (we dislike to say "Rubber") and some not so well known, which are none the worse for that.

Number of samples represented by Figure 1 ..... 1  
Character, clear liquor, very heavy white mineral deposit. Showing the compound to be heavily adulterated with white lead.

Number of samples represented by Figure 2 ..... 8  
Character, inky black liquor from dissolved gums, oils, or resins, other than rubber.

Number of samples represented by Figure 3 ..... 3  
Character, black or dirty liquor. Abundant chalky or dirty mineral deposit.

Number of samples represented by Figure 4 ..... 1  
Contents all kinds of **HABIRSHAW**.

Character, clear liquor showing absence of gums, oils, or resins, other than rubber. No deposit, showing absence of dirt or mineral impurity. \_\_\_\_\_

Number of samples tested ..... 13

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

## HABIRSHAW FOR A SOAP FACTORY.

UNIVERSITY OF CINCINNATI—Physical Department.

CINCINNATI, April 17, 1890.

*The Electrical Supply Co.*

GENTLEMEN: Your letter concerning Habirshaw Wires duly received. My test of the Habirshaw Wire was perfectly satisfactory as to insulation resistance under water. I commend the insulation as of high grade. I have not the facilities for testing how the wire would withstand the special conditions prevailing in a soap and candle factory.

Very sincerely,

(Signed)

THOS. FRENCH, JR.

W. H. Bauder states that over a year ago he tested, for Leonard & Izard, all of the different rubber wires with a view of determining which would best stand for the work in a soap factory; using, for the test, caustic; also boiling oil, at all degrees of heat. After 72 hours' test it was found that the insulation on the other rubber wires had dropped off, leaving the wire exposed; but there was no injurious effect on the Habirshaw, which was selected, and has given no trouble.

## HABIRSHAW IN EXTREME HEAT.

A prominent electrician (who desires not to have his name used) has written us, under date of May 21, 1890, as follows:

"Inclosed please find sample of Habirshaw Wire that I had in a dry kiln for one hundred and sixty-eight (168) hours at a temperature of two hundred and twelve (212) degrees; also a piece of..... Wire No. 18, that was tested in the same way."

The samples above referred to are now in possession of The E. S. Co., Chicago. The contrast in their present condition is very marked. The Habirshaw sample, which was Taped Standard Wire, was in good condition, showing no visible effect of any injury whatever to the covering or insulation. The .....sample, which was their Braided Insulation, was very much damaged, looking as though it had passed through a severe test of dynamite.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

# HABIRSHAW INDIA-RUBBER INSULATION

*Continued.*

NEW YORK, April 15, 1890.

*W. M. Habirshaw, Esq.,*

159 Front Street, New York City.

DEAR SIR: In response to yours of yesterday's date, regarding your Standard India Rubber Core Wires, would say we have used the same in various paper mills throughout the State, which is about as severe a test on a wire, both for moisture and acids, as we know of, and as they have been using the wire for several years (5 years probably) with no complaints, we presume it is giving every satisfaction.

We have also used the wire in Russian Baths in the city for over a year, where it has stood the test admirably.

Yours respectfully,

BATEMAN & POLLARD.

PHILADELPHIA, Feb. 21, 1889.

*India Rubber and G. P. Insulating Co.,*

159 Front Street, New York.

GENTLEMEN: We have been using your White Core Wire almost exclusively during the last year for our Incandescent Work. In this time we have wired the Drexel Building, 2,000 lights; Keystone Bank, 400 lights; Catholic High School, 600 lights; and a large number of other buildings—total number of lights probably 10,000 to 12,000—and we are pleased to say that we have never had the least trouble with the insulation, which we consider A1. We might add that the local Edison Company in this city have had their inspectors examining and testing the work done, and they say that the Habirshaw Insulation shows up first-class and above all others.

Yours very truly,

WALKER & KEPLER.

EAU CLAIRE, WIS., Nov. 14, 1890.

*The Electrical Supply Co.,*

171 Randolph St., Chicago.

GENTLEMEN: We have your favor of the 7th, and take great pleasure in adding our testimonial to many others regarding the merits of Habirshaw Insulation. We have used considerable quantities of it in the last year, and have no hesitancy whatever in recommending it as absolutely the best water-proof wire in existence to-day.

Yours very truly,

NATIONAL ELECTRIC M'FG CO.,

C. KAMMEYER, Supt.

ELGIN, ILL., Dec. 16, 1890.

*The Electrical Supply Co.,*

Chicago, Illinois.

GENTLEMEN: In answer to your favor of the 15th inst., we beg leave to state that we used during the last year for all concealed work, also in very damp places, the Habirshaw Wire exclusively, and it never has given us any trouble whatever.

Yours truly,

ELGIN CITY RAILWAY CO.,

C. WUESTENFELD, Mgr.

Pure Para Rubber is the only Organic Substance used in the Habirshaw Insulation.

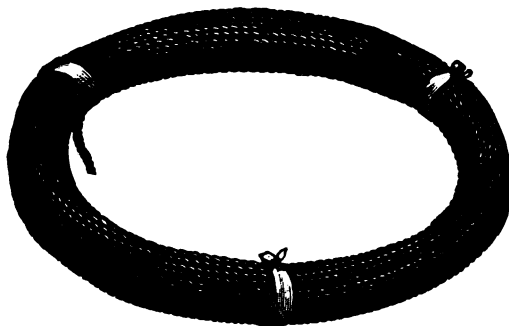


## GRIMSHAW RUBBER WIRES.

Size of Conductor, Brown & Sharpe Gauge.	Outside Diam. of Insulation in 32ds of an inch.	White Core Insulation.				Black Core Insulation.			
		Solid Conductor.		Stranded Conductor.		Solid Conductor.		Stranded Conductor.	
		Trade No.	Price per 100 feet.	Trade No.	Price per 100 feet.	Trade No.	Price per 100 feet.	Trade No.	Price per 100 feet.
18	4	220	\$1.90	-----	-----	320	\$1.65	-----	-----
18	6	222	2.10	-----	-----	322	1.85	-----	-----
16	4	223	2.15	-----	-----	323	1.75	-----	-----
16	7	226	2.45	-----	-----	326	2.00	-----	-----
14	5	-----	-----	-----	-----	327	2.10	-----	-----
14	6	228	2.70	-----	-----	-----	-----	-----	-----
14	8	230	3.50	-----	-----	330	3.25	-----	-----
12	7	231	3.50	-----	-----	331	3.25	-----	-----
12	9	233	4.00	-----	-----	333	3.85	-----	-----
10	7	-----	-----	-----	-----	334	4.00	-----	-----
10	8	235	4.50	-----	-----	-----	-----	-----	-----
10	9	236	5.00	-----	-----	336	4.50	-----	-----
8	9	237	5.50	-----	-----	337	4.75	-----	-----
8	11	238	6.50	-----	-----	338	5.75	-----	-----
8	12	-----	-----	704	\$ 8.00	-----	-----	804	\$ 6.25
6	11	239	8.25	-----	-----	339	6.50	-----	-----
6	13	240	9.50	-----	-----	340	8.40	-----	-----
6	12	-----	-----	705	9.50	-----	-----	805	7.75
6	14	-----	-----	706	11.00	-----	-----	806	9.00
5	13	241	9.90	-----	-----	341	8.90	-----	-----
5	15	242	10.25	-----	-----	342	9.50	-----	-----
5	15	-----	-----	707	12.00	-----	-----	807	9.75
4	13	243	10.50	-----	-----	343	9.60	-----	-----
4	15	244	12.50	-----	-----	344	11.50	-----	-----
4	15	-----	-----	708	14.50	-----	-----	808	12.00
4	17	-----	-----	709	16.00	-----	-----	809	15.00
3	15	245	13.50	-----	-----	345	12.00	-----	-----
3	17	245½	15.00	-----	-----	346	13.50	-----	-----
3	16	-----	-----	710	18.00	-----	-----	810	16.60
3	18	-----	-----	711	19.50	-----	-----	811	18.00
2	16	246	16.50	-----	-----	347	15.50	-----	-----
2	18	246½	18.00	-----	-----	348	17.00	-----	-----
2	17	-----	-----	712	20.00	-----	-----	812	19.00
2	19	-----	-----	713	23.00	-----	-----	813	22.00
1	17	247	22.00	-----	-----	349	20.00	-----	-----
1	19	247½	24.00	-----	-----	350	22.00	-----	-----
1	18	-----	-----	714	27.00	-----	-----	814	26.00
1	20	-----	-----	715	30.00	-----	-----	815	29.00
0	18	248	29.00	-----	-----	351	28.00	-----	-----
0	20	248½	32.50	-----	-----	352	31.00	-----	-----
0	20	-----	-----	716	32.00	-----	-----	816	30.25
0	22	-----	-----	717	37.50	-----	-----	817	34.00
00	22	-----	-----	718	40.00	-----	-----	818	38.50
00	24	-----	-----	719	45.00	-----	-----	819	43.50
000	24	-----	-----	720	50.00	-----	-----	820	45.00
000	25	-----	-----	721	55.00	-----	-----	821	50.00
0000	24	-----	-----	722	60.00	-----	-----	822	57.50
0000	26	-----	-----	723	65.00	-----	-----	823	62.50

In ordering please use trade number.

## INCANDESCENT LAMP CORD.



COTTON COVERED.			SILK COVERED.		
Trade No.	Equivalent to	Price per Yard.	Trade No.	Equivalent to	Price per Yard.
273	12 B. & S.	\$0.35	278	12 B. & S.	\$0.44
274	14 "	.24	279	14 "	.32
275	16 "	.13 $\frac{3}{4}$	280	16 "	.20
276	18 "	.10	281	18 "	.17 $\frac{1}{4}$
277	20 "	.08	282	20 "	.13

Each strand composed of fine wires, insulated with rubber and braided, and both conductors twisted together.

Furnished in different colors or combination of colors.

## FIRE-PROOF INCANDESCENT LAMP CORD.



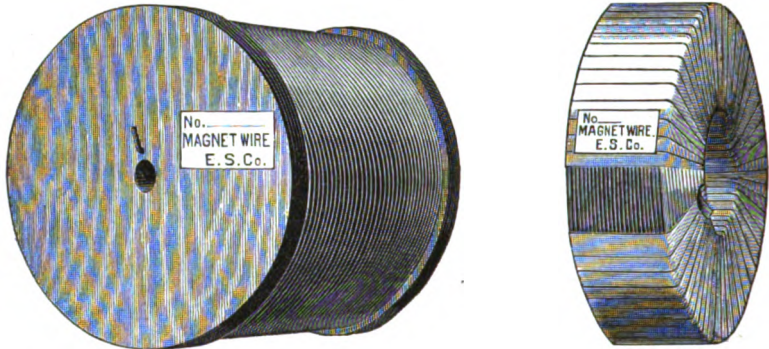
This Cord is manufactured by a process which renders it absolutely *Fire, Water, and Moisture Proof*.

It will char under extreme heat, but *will not conduct flame*. This property renders it very desirable as a factor of safety in wiring dry goods houses, factories, and private dwellings.

COTTON COVERED.			SILK COVERED.		
Trade No.	Equivalent to	Price per Yard.	Trade No.	Equivalent to	Price per Yard.
283	12 B. & S.	\$0.38	289	12 B. & S.	\$0.48
284	14 "	.28	290	14 "	.40
285	16 "	.17	291	16 "	.27
286	18 "	.13	292	18 "	.21
287	20 "	.10	293	20 "	.17

## MAGNET WIRE.

FOR ARMATURES, FIELD MAGNETS, ETC.



COTTON WOUND—To No. 20, B. & S. Gauge.

Number.	Diam. Bare Wire.	Single.	Double.	Number.	Diam. Bare Wire.	Single.	Double.
0000.....	.4600	\$0.42	\$0.44	9.....	.11443	\$0.44	\$0.48
000.....	.4096	.42	.44	10.....	.10189	.44	.48
00.....	.3648	.42	.44	11.....	.09074	.46	.50
0.....	.3249	.42	.44	12.....	.08081	.46	.50
1.....	.2893	.42	.44	13.....	.07196	.52	.56
2.....	.2576	.42	.44	14.....	.06408	.52	.56
3.....	.2294	.42	.44	15.....	.05706	.56	.60
4.....	.20431	.42	.44	16.....	.05082	.56	.60
5.....	.18194	.42	.44	17.....	.04525	.58	.64
6.....	.16202	.42	.44	18.....	.04030	.58	.64
7.....	.14428	.42	.46	19.....	.03589	.62	.70
8.....	.12849	.42	.46	20.....	.03196	.62	.70

We will furnish on reels in continuous lengths of about 150 lbs. each, or in coils of about 50 lbs. each. For reels and cases we charge \$2.50 each, and will allow the full amount charged when returned to our factory at Ansonia, Conn., in good order and without expense to us. Any arrangement about the delivery of wire does not affect the returning of the reels.

Our Magnet Wire is of the best quality. The copper used is the purest, and unusually soft, and is uniformly drawn to an exact diameter.

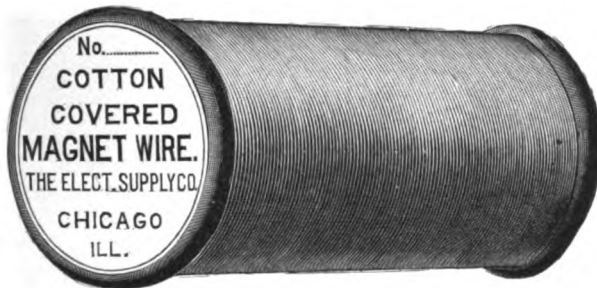
We make a specialty of furnishing Magnet Wire of an exact outside diameter, and any orders sent to us, giving the diameter of bare wire and outside diameter in thousandths of an inch, will be filled precisely as specified.

For special sizes of Magnet Wire, our prices are the same as the next finer regular size.

## MAGNET WIRE

*Continued.*

## COTTON WOUND.



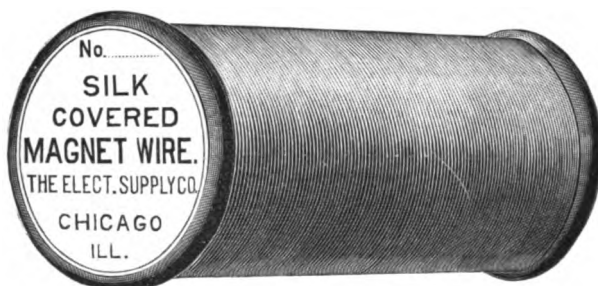
Finer than No. 20, B. &amp; S. Gauge.

No.	Diameter Bare Wire.	SINGLE.				DOUBLE.			
		Regular Spools, per Pound.	1 Pound Spools, per Pound.	4 Ounce Spools, per Ounce.	1 Ounce Spools, per Ounce.	Regular Spools, per Pound.	1 Pound Spools, per Pound.	4 Ounce Spools, per Ounce.	1 Ounce Spools, per Ounce.
21	.02846	\$0.70	\$0.80	\$0.06	\$0.07½	\$0.88	\$0.98	\$0.07½	\$0.09
22	.025347	.76	.86	.06½	.08	.95	1.05	.08	.09½
23	.022571	.83	.93	.07	.08½	1.05	1.15	.08½	.10
24	.0201	.90	1.00	.07½	.09	1.14	1.24	.09	.10½
25	.0179	1.00	1.10	.08	.09½	1.27	1.37	.10	.11½
26	.01594	1.10	1.20	.09	.10½	1.38	1.48	.10½	.12
27	.014195	1.25	1.35	.09½	.11	1.57	1.67	.12	.13½
28	.012641	1.35	1.45	.10½	.12	1.69	1.79	.12½	.14
29	.011257	1.50	1.60	.11½	.13	1.89	2.00	.14	.15½
30	.010025	1.65	1.75	.12	.14	2.07	2.17	.15	.17
31	.008928	1.80	1.90	.13	.15	2.23	2.33	.16	.18
32	.00795	2.25	2.35	.16	.18	2.62	2.72	.18½	.20½
33	.00708	2.76	2.86	.19	.21	3.28	3.38	.22½	.24½
34	.0063	3.28	3.38	.23	.25	3.93	4.03	.27	.29
35	.00561	3.74	3.84	.25	.27	4.46	4.56	.30	.32
36	.005	5.04	5.14	.34	.36	5.67	5.77	.38	.40

## MAGNET WIRE.

*Continued.*

## SILK WOUND.



White or Green, B. &amp; S. Gauge.

No.	Diameter Bare Wire.	SINGLE.				DOUBLE.			
		Regular Spools, per Pound.	1 Pound Spools, per Pound.	4 Ounce Spools, per Ounce.	1 Ounce Spools, per Ounce.	Regular Spools, per Pound.	1 Pound Spools, per Pound.	4 Ounce Spools, per Ounce.	1 Ounce Spools, per Ounce.
16	.05082	\$1.12	\$1.22	\$0.09	\$0.10	\$1.53	\$1.63	\$0.11 $\frac{1}{2}$	\$0.12 $\frac{1}{2}$
17	.04525	1.12	1.22	.09	.10	1.53	1.63	.11 $\frac{1}{2}$	.12 $\frac{1}{2}$
18	.04030	1.15	1.25	.09	.10	1.57	1.67	.12	.13
19	.03589	1.15	1.25	.09	.10	1.57	1.67	.12	.13
20	.03196	1.18	1.28	.09 $\frac{1}{2}$	.10 $\frac{1}{2}$	1.61	1.71	.12 $\frac{1}{2}$	.13 $\frac{1}{2}$
21	.02846	1.20	1.30	.09 $\frac{1}{2}$	.10 $\frac{1}{2}$	1.63	1.73	.12 $\frac{1}{2}$	.13 $\frac{1}{2}$
22	.025347	1.30	1.40	.10	.11 $\frac{1}{2}$	1.76	1.86	.13	.14
23	.022571	1.42	1.52	.10	.11 $\frac{1}{2}$	1.93	2.13	.15	.16
24	.0201	1.56	1.66	.12	.13 $\frac{1}{2}$	2.13	2.23	.16	.17
25	.0179	1.81	1.91	.12 $\frac{1}{2}$	.14 $\frac{1}{2}$	2.48	2.58	.18	.19
26	.01594	2.10	2.20	.15	.17	2.88	2.98	.20	.22
27	.014195	2.25	2.35	.16	.18	3.07	3.17	.21	.23
28	.012641	2.38	2.48	.17	.19	3.23	3.33	.22	.24
29	.011257	2.75	2.85	.19	.20	3.76	3.86	.26	.28
30	.010025	2.95	3.05	.21	.22	4.02	4.12	.27	.29
31	.008928	3.25	3.35	.23	.24	4.40	4.50	.30	.32
32	.00795	3.96	4.01	.27	.28	5.21	5.31	.35	.37
33	.00708	4.49	4.59	.30	.32	5.87	5.97	.39	.41
34	.0063	4.72	4.82	.32	.33	6.10	6.20	.40	.42
35	.00561	6.72	6.82	.44	.45	8.95	9.05	.58	.60
36	.005	8.05	8.15	.52	.54	10.21	10.31	.66	.68

# INSULATED GERMAN SILVER WIRE

FOR RESISTANCE COILS.



No. B. & S. Gauge.	WHITE, COTTON WOUND.		GREEN, SILK WOUND.	
	Single. per Pound.	Double. per Pound.	Single. per Pound.	Double. per Pound.
16	\$ 1.40	\$ 1.70	\$ 1.85	\$ 2.38
17	1.40	1.70	1.85	2.38
18	1.40	1.70	1.85	2.38
19	1.40	1.70	1.85	2.38
20	1.42	1.74	1.88	2.43
21	1.44	1.75	1.93	2.48
22	1.52	1.83	2.06	2.64
23	1.62	1.98	2.21	2.87
24	1.71	2.09	2.37	3.08
25	1.84	2.26	2.65	3.48
26	2.05	2.48	3.02	3.93
27	2.25	2.73	3.23	4.20
28	2.45	2.98	3.42	4.43
29	2.60	3.13	3.85	5.00
30	2.84	3.38	4.14	5.33
31	3.09	3.66	4.52	5.81
32	4.14	4.84	5.68	7.17
33	4.55	5.33	6.27	7.93
34	5.31	6.25	6.71	8.38
35	5.76	6.55	8.65	10.86
36	9.30	10.21	11.50	13.50
37	14.95	15.81	21.28	25.30
38	27.60	31.05	32.20	38.00
39	31.05	34.50	34.50	46.00
40	34.50	38.00	51.75	57.50

Our German Silver is of the same quality as used by the British Association for standard Resistance Coils. It has a resistance approximately fifteen times that of copper.

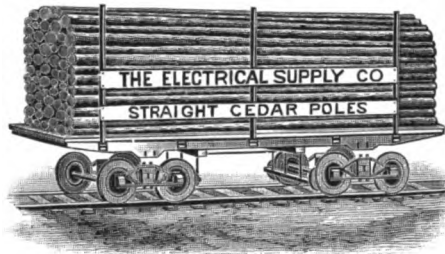


## EQUIPMENT MATERIAL

### AND SPECIAL LINE DEVICES.

IN our selection of the articles in this department, we have carefully investigated the devices in use on a great many lines, and have had the assistance of men with wide experience in actual construction work. All devices, before being accepted, have been referred to our Engineering Department, and none has been passed containing actual defects which could be discovered. Improvements have been made on a great many articles which are not entirely new, while a number of new devices have been added, which we hope will prove of material assistance in line equipment.

## WHITE CEDAR POLES.



Size.	Average Weight, Pounds each.	Approximate No. of Poles to a Car.	Size.	Average Weight, Pounds each.	Approximate No. of Poles to a Car.
25 feet 4 inches	160	170	35 feet 7 inches	650	90
25 " 5 "	200	150	35 " 8 "	700	85
25 " 6 "	250	120	35 " 9 "	850	70
25 " 7 "	325	100	40 " 6 "	800	80
25 " 8 "	475	75	40 " 7 "	900	75
25 " 9 "	550	60	40 " 8 "	950	70
30 " 5 "	300	110	45 " 6 "	1000	65
30 " 6 "	350	90	45 " 7 "	1200	55
30 " 7 "	420	75	50 " 6 "	1400	52
30 " 8 "	600	55	50 " 7 "	1500	40
30 " 9 "	700	45	55 " 7 "	1800	37
35 " 6 "	550	100	60 " 7 "	1700	35

Poles 40 feet long and over require two cars.

Shipments made from Chicago yard, or, where time permits, from point where poles are cut. Poles shipped from original loading point direct to destination can be sold at a lower figure, as extra freight and cost of a second handling are thereby saved. We will quote prices delivered in any part of the United States or Canada.

## WIRES AND STRANDS FOR POLE GUYS.

### GALVANIZED STEEL WIRE.



No. Iron Wire Gauge.	No. B. & S. Gauge.	Weight per 100 feet, lbs.	Estimated Breaking Strain, lbs.	Price, per lb.
4	3	13.39	3,400	\$0.08
6	4½	9.73	2,500	.08
8	6	6.96	1,750	.08

### GALVANIZED STEEL WIRE STRANDS.



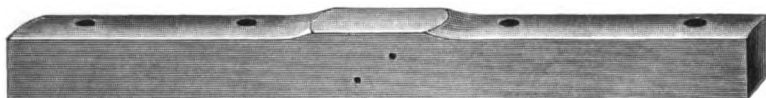
Trade No.	Diameter, inches.	Weight per 100 feet, lbs.	Estimated Breaking Strain, lbs.	Price, per 100 feet.
1109	½	50	10,000	\$5.40
1110	⅝	29½	6,300	3.30
1111	¾	12	2,300	1.40
1112	⅞	7	1,500	1.00

## STANDARD CROSS ARMS.

Regular Size,  $3\frac{1}{2}$  Inches  $\times$   $4\frac{1}{2}$  Inches,  $1\frac{1}{2}$  Inch Holes.

No. 931.	3 feet, 2 pin	.....	each,	\$0.20
" 931 $\frac{1}{2}$ .	4 " 4 "	.....	"	.30
" 932.	5 " 4 "	.....	"	.41
" 933.	6 " 6 "	.....	"	.48

## SPECIAL CROSS ARMS.

Extra Heavy. 4 Inches  $\times$  6 Inches,  $1\frac{1}{2}$  Inch Holes.

No. 927.	3 feet, 2 pin	.....	each,	\$0.35
" 928.	4 " 4 "	.....	"	.45
" 929.	5 " 4 "	.....	"	.57

For heavy feeder lines. Suitable for carrying No. 0000 wire. All shipments will be made direct from factory.

## P. &amp; B. PAINTED CROSS ARMS.

 $3\frac{1}{2}$  Inches  $\times$   $4\frac{1}{2}$  Inches,  $1\frac{1}{2}$  Inch Holes.

No. 936.	3 feet, 2 pin	.....	each,	\$0.30
" 937.	4 " 4 "	.....	"	.40
" 938.	5 " 4 "	.....	"	.50

These Cross Arms are thoroughly coated with P. & B. Compound, greatly improving the insulation, and are specially recommended for lines carrying high potentials.

## CROSS ARM BRACES.



No. 949.	Japanned; length, 20 inches	.....	each,	\$0.12
" 949C.	Complete, with two lag screws 2 in. $\times$ $\frac{5}{8}$ in., and one lag screw 3 in. $\times$ $\frac{5}{8}$ in.	.....	"	.16
" 950.	Japanned; length, 24 inches	.....	"	.20
" 950C.	Complete, with two lag screws 2 in. $\times$ $\frac{5}{8}$ in., and one lag screw 3 in. $\times$ $\frac{5}{8}$ in.	.....	"	.24

## LAG SCREWS.



No. 1029.	$\frac{1}{2}$ x6 in., with washers (for cross arms)	.....	each, \$0.04
" 1025.	$\frac{1}{2}$ x7 " " " " " "	.....	".04 $\frac{1}{2}$
" 1024.	$\frac{1}{2}$ x8 " " " " " "	.....	.05
" 1023 $\frac{1}{2}$ .	$\frac{5}{8}$ x2 " " (for cross-arm brace)	.....	.02
" 1023.	$\frac{5}{8}$ x3 " " " " " "	.....	.02 $\frac{1}{2}$

## POLE STEPS.



No. 1026.	Plain, $\frac{9}{16}$ x9 $\frac{1}{2}$	.....	each, \$0.05 $\frac{1}{2}$
" 1026 G.	Galvanized, $\frac{9}{16}$ x9 $\frac{1}{2}$	.....	".08

## POLE STEPS.



No. 1027.	Plain, $\frac{9}{16}$ x9	.....	each, \$0.05 $\frac{1}{2}$
" 1027 G.	Galvanized, $\frac{9}{16}$ x9	.....	".08

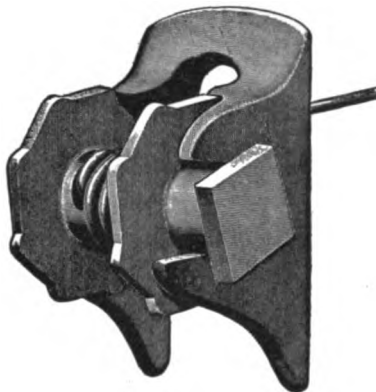
## POLE STEPS.



No. 1028.	Plain, $\frac{5}{8}$ x8	.....	each, \$0.07 $\frac{1}{2}$
" 1028 G.	Galvanized, $\frac{5}{8}$ x8	.....	".10

## SAFETY WIRE TIGHTENER.

For Suspension and Guy Wires. Patented.



No. 2411. Price .....each, \$0.16

## WELDED EYE BOLTS.

For Suspension and Guy Wires.



No. 1082.  $\frac{1}{2}$  x 10 .....each, \$0.09  
 " 1083.  $\frac{1}{2}$  x 12 ..... " .10

## TURN-BUCKLE.



No. 1050. Right and left hand thread .....each, \$1.25

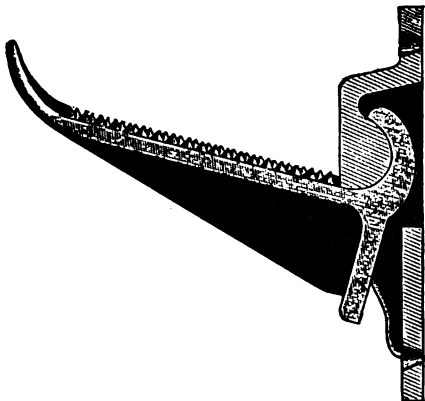
## INSULATED TURN-BUCKLE.



No. 4278. Price .....each, \$1.50

To insulate Suspension and Guy Wires, preventing leakage of current when accidentally brought in contact with live wires.

## REMOVABLE POLE STEP.

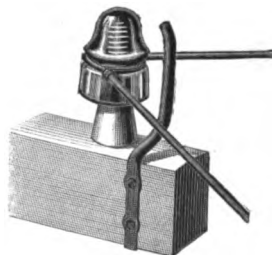
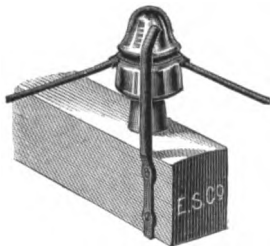


No. 1033.

Pole Steps, only .....each, \$0.50  
 Sockets, only ..... " .20

Instead of trimmers carrying a ladder all day in addition to carbons, we fasten a socket on either side of the pole. The trimmer takes two small steps, placing one in each of the sockets, goes up the pole, trims the lamp, comes down, takes out his steps, goes to the next lamp post, and so on.

## GUARD ARMS.



These Guard Arms furnish additional support for wires at places where they turn sharp angles. At such points the strain is considerable, and pins, brackets, and insulators are liable to be broken. Two forms of Guard Arms are made—one for oblique and the other for right-angle turns.

No. 947. Straight, for use at right angles, or less .....each, \$0.24  
 " 948. Bent, for use at oblique turns ..... " .27

## RUBBER HOOK INSULATOR.



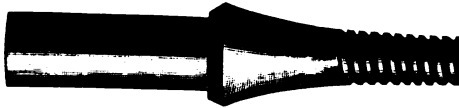
No. 988. Price .....each, \$0.15

## OAK PINS.



- No. 914. Regular oak, painted,  $1\frac{1}{2}$  inch ..... per 1,000, \$15.00  
 " 913. Special split selected oak, painted,  $1\frac{1}{2}$  inch ..... " 25.00

## LOCUST PINS.



- No. 915. Unpainted,  $1\frac{1}{2}$  inch ..... per 1,000, \$32.00

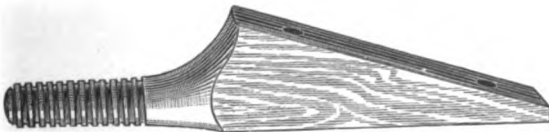
We make a specialty of fine quality Locust Pins.

## CORNER PINS.



- No. 914 B. Special split oak, painted,  $1\frac{1}{2}$  inch, with bolt and washer, complete ..... each, \$0.08

## OAK BRACKETS.



- No. 917. Regular size, painted ..... per 1,000, \$22.00  
 " 918. Large size, painted ..... " 25.00

## HIGH INSULATION BRACKETS.

(Trade-mark, "High Insulation.")

Registered.

Patented January 13, 1891.

" June 2, 1891.

" November 17, 1891.

Other patents applied for.

In the following pages we show a complete system of special wiring appliances, possessing the advantage over ordinary insulator-supporting cleats that the insulator itself is always held in an absolutely upright position, so that moisture cannot get under it and destroy its insulating properties. *High insulation* is essential to the economical operation of electric apparatus. The devices we here offer will be found especially serviceable for all durable and permanent line work.

This system contains a number of special brackets invented by Mr. T. Carpenter Smith, from whom they were purchased by us, and which are fully covered by patents. *Infringers will be vigorously prosecuted.*

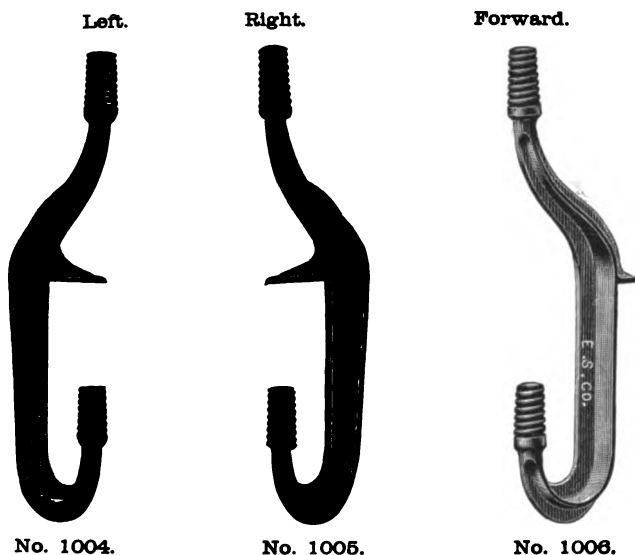
The trade-mark "High Insulation" has been registered, and is our exclusive property, and must not be used by any one else in connection with iron brackets without our permission.

**SPECIAL INSTRUCTIONS.**—Always place a small amount of oakum, brown paper, tape, or some soft material (that will not hold moisture) between the iron screw and the glass insulator. This is necessary to prevent danger of cracking the glass from the differential expansion due to changes of temperature.

## HIGH INSULATION BRACKETS

*Continued.*

## LOOP OR SPREADER BRACKETS.



These attachments are for pole lines, to be used on cross-arms for the taking off of loops when they are to be carried to branch lines or to converters.

Nos. 1004 and 1005 may be attached either upon the end or upon the side of cross-arms.

No. 1006 is the same bracket as above, except that the angle at which the insulators are protruded is perpendicular, or at a right angle to the surface to which it is attached. A small bracket is also provided for the top of the cross-arm or other object to which the bracket is attached, to provide against downward pull or strain from the wires.

No. 1004, Left .....	each, \$0.50
“ 1005, Right .....	“ .50
“ 1006, Forward .....	“ .50

## HIGH INSULATION BRACKETS

*Continued.*

### WALL BRACKET.



The wires are led from the Spreader Arms to these Brackets, thence down to the window, converter, or other device, to be supplied.

No. 1007. Price .....each, \$0.30

### ROOF BRACKET.

**OFFSET.**



This Bracket is intended to be fastened on the edge of the roof. The offset is for the purpose of leading down over the edge of the cornice.

No. 1008. Price .....each, \$0.30

### ROOF BRACKET.

**STRAIGHT.**



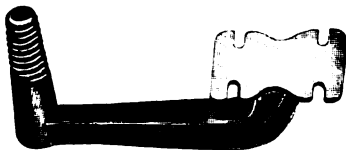
This Bracket is for running wires along the top of roofs, or for attaching to the extreme top of uprights upon roofs, which support cross-arms, and are seldom used.

No. 1009. Price .....each, \$0.25

## HIGH INSULATION BRACKETS

*Continued.*

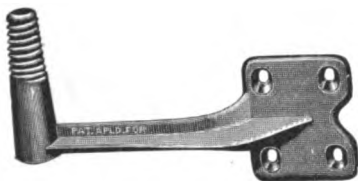
### CORNICE BRACKET.



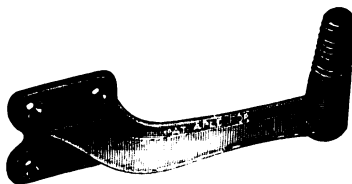
This Bracket is intended for wire work upon the under side of cornices, which are difficult to screw insulators upon without inverting them or holding them at an angle where the moisture will destroy the insulating qualities.

No. 1010. Price.....each, \$0.30

### LATERAL BRACKETS.



Left.



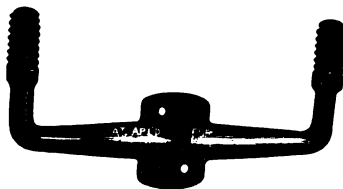
Right.

For running wires from corner to corner of buildings. They are made both right and left, and may be fastened to brick, stone, or other walls, supporting the insulator always in an upright position.

No. 1011. Right, price.....each, \$0.30

" 1012. Left, " ..... " .30

### COMBINATION BRACKET.



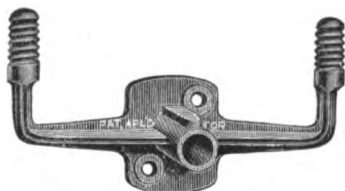
This Bracket can be attached direct to a pole, taking the place of a cross-arm and two pins. It is particularly useful in turning a corner.

No. 1015. Price.....each, \$0.30

## HIGH INSULATION BRACKETS

*Continued.*

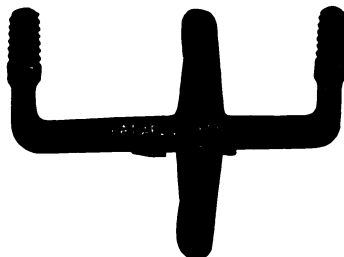
### REFLECTOR BRACKET.



This Bracket serves the double purpose of a proper support for the ends of a pipe arm carrying a street lamp, and for the attachment of glass insulators for leading the wires down to the same. It also provides for thorough insulation and mechanical support, while giving a neater appearance than can be had in any other way where the wires are run to the street hood on the outside of the pipe.

No. 1016. Price.....each, \$0.60

### CONVERTER BRACKET.



This Bracket is intended to carry a one light converter or shunt box, used in connection with the series system of street lighting. Upon application we will furnish blue print showing improved method of making attachment in connection with this Bracket, by which the danger of the circuit coming open, by the wire breaking at the insulator, is entirely avoided.

No. 1017. Price.....each, \$0.50

### SIDE BRACKET.



For use where Pin and Bracket can not be placed.

No. 1018. Price.....each, \$0.15

## REMOVABLE PIN BREAK-ARM.



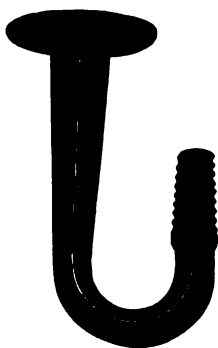
No. 1001. Price ..... each, \$0.55

## PERMANENT PIN BREAK-ARM.

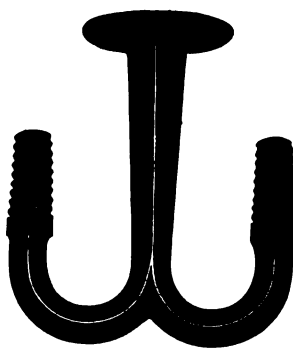


No. 1002. For 1½-inch hole ..... each, \$0.50

## CEILING BRACKETS.



Single.



Double.

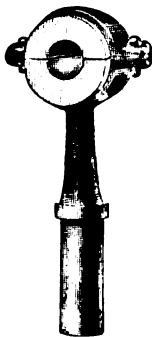
No. 1013. Single ..... each, \$0.30  
 “ 1014. Double ..... “ .40

## IRON PIN.



No. 916.  $1\frac{1}{2}$  inch. .... each, \$0.20

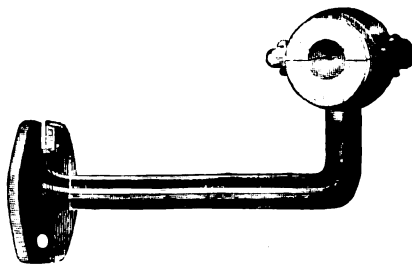
## FLETCHER'S INSULATING IRON PIN.



Patented.

No. 2931.	$\frac{1}{4}$ in.	Glass insulation	.....	each, \$0.30
" 2932.	$\frac{3}{8}$ "	" "	.....	" .30
" 2933.	$\frac{1}{2}$ "	" "	.....	" .30
" 2934.	$\frac{5}{8}$ "	" "	.....	" .30
" 2935.	$\frac{3}{4}$ "	" "	.....	" .30

## FLETCHER'S INSULATING IRON BRACKET.



Patented.

No. 2921.	$\frac{1}{4}$ in.	Glass insulation	.....	each, \$0.50
" 2922.	$\frac{3}{8}$ "	" "	.....	" .50
" 2923.	$\frac{1}{2}$ "	" "	.....	" .50
" 2924.	$\frac{5}{8}$ "	" "	.....	" .50
" 2925.	$\frac{3}{4}$ "	" "	.....	" .50

## FLUID INSULATOR.

GLASS.



For full description see following page.

## FLUID INSULATOR

*Continued.*

The insulator supports of an overhead line are the most vital points of importance to the insulation resistance of the entire line, and those that are the most advanced in electric light and power work have learned from experience the economy of carefully insulating the line to prevent the leakage of current.

The Fluid Insulators are especially designed to prevent surface leakage, and to give an insulation many hundred times higher than that obtained from the ordinary forms of glass insulators now in use. An insulating fluid, which is not sufficiently dense to support even a film of dust or moisture, is placed in a recess formed in the glass, and well protected from the weather. In this way a fluid surface, which is always clean and highly insulating, even in the dampest weather, is interposed between "line" and "earth." It can be readily observed that, although the first outlay for these insulators may be greater than that for ordinary glass insulators, the subsequent saving in running expenses and the avoidance of trouble from leakage, especially in rainy weather, will more than repay first expenses within a very short time.

In power transmission, where it is desired to transmit heavy currents of high electro-motive force, the use of Fluid Insulators is an absolute necessity to success. In connection with this we would call attention to Prof. Badt's Electric Transmission Hand-book, and particularly to the tests of Prof. Weber mentioned on page 51.

The "Insulation Fluid" will not freeze, evaporate, nor creep like paraffine or mineral oils, and will last three or four years even in a hot climate. It is, therefore, advisable to use the Fluid intended for the insulator and not cheap substitutes.

A conception of the value of Fluid Insulators may be gathered from the fact that at the present time they are in use all over the world by various governments, telegraph, telephone, and electric light and power companies, but nevertheless, although foreign companies have been using them for over twelve years, and their insulating properties have become a matter of record, they have not heretofore been extensively adopted in the United States, principally on account of the less care used in these matters by people in this country and their advance in price over those commonly in use. In placing them before the electrical public we appeal to the intelligence of the purchaser rather than to his preconceived ideas of economy, and feel confident that if these insulators are once adopted their record will justify our claims for their excellence and our confidence in the intelligence of the purchaser.

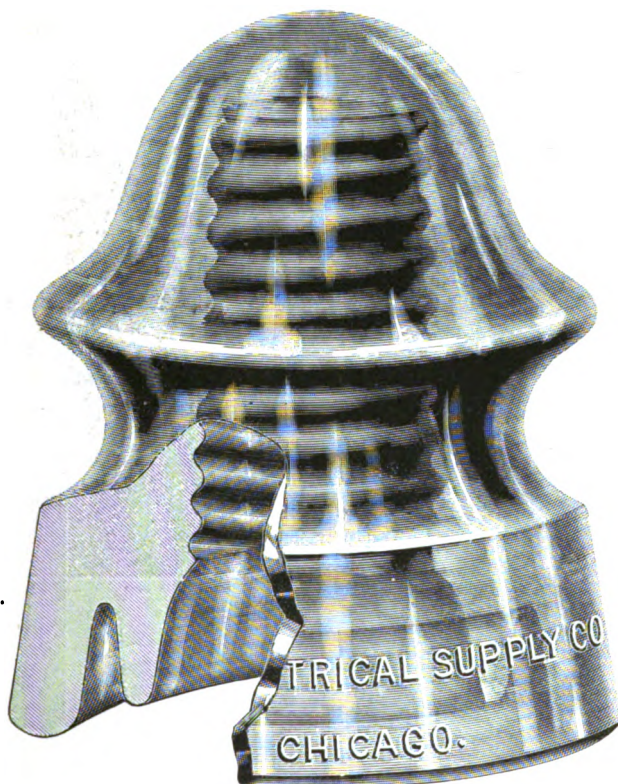
Experience has demonstrated that for pressures of over 400 volts the electric light purchaser can not afford to use any but the Fluid Insulators. The following test may be of interest:

Twenty ordinary and twenty oil insulators were placed on poles in the usual manner, and during three years constant observations gave the following result:

20 Fluid Insulators=12.960 Megohms—each 259.2 Megohms.  
20 ordinary " = .222 " = " 4.4 "

925.	Fluid Insulators, only (Glass).....	per 1,000, \$400.00
925 P.	Special Locust Pins.....	" " 50.00
925 C.	Spring Cotters for Pins.....	" " 40.00
925 F.	Fluid (30 gal. sufficient for 1,000) .....	" 30 gal. 30.00

## DOUBLE PETTICOAT, EXTRA LARGE GROOVE GLASS INSULATOR.



Cut Full Size.

No. 909. Per 1,000..... \$67.50

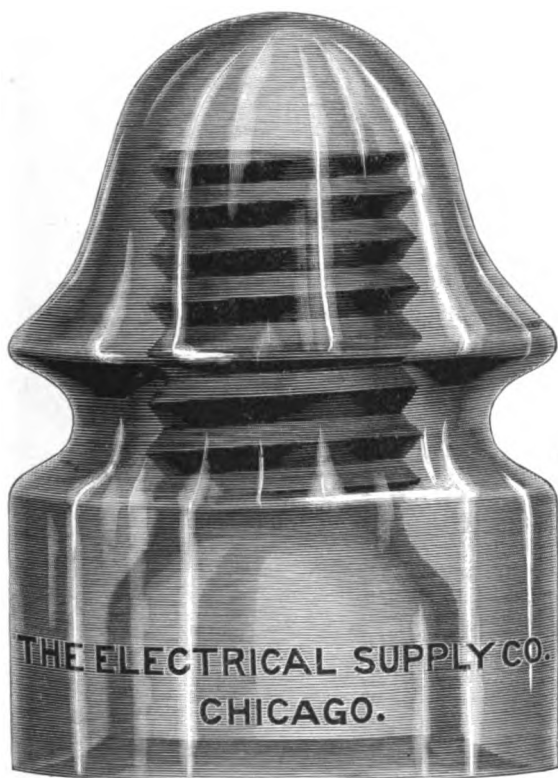
## DOUBLE PETTICOAT, DEEP GROOVE GLASS INSULATOR.



Cut Full Size.

No. 908. Per 1,000 ..... \$62.50

## DEEP GROOVE GLASS INSULATOR.



Cut Full Size.

No. 905. Per 1,000..... \$50.00

## REGULAR GLASS INSULATOR.



**Cut Full Size.**

Adapted for No. 6 B. & S. Insulated wire, and finer.

No. 903. Per 1,000.....\$17.50

## DOUBLE PETTICOAT PONY GLASS INSULATOR.



Cut Full Size.

No. 906. Per 1,000 .....\$42.50

## PONY GLASS INSULATOR.

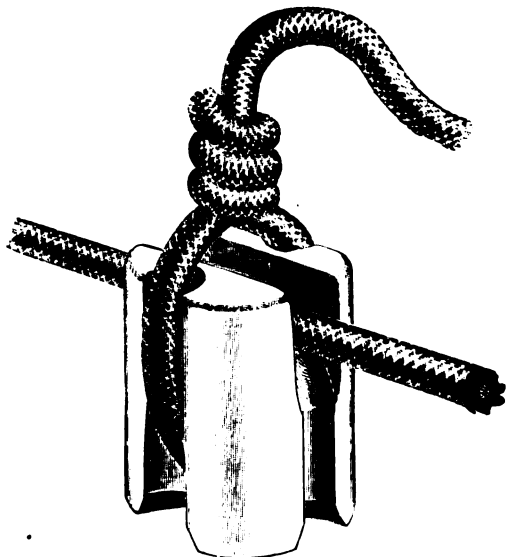


**Cut Full Size.**

Used in branch lines and light construction work. Made to fit the regular screw bracket.

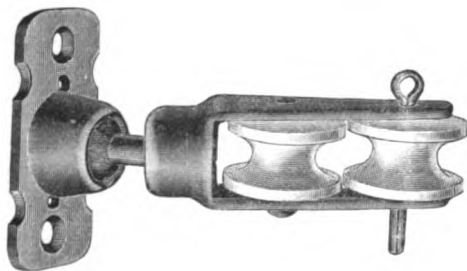
No. 901. Per 1,000 ..... \$37.50

## BREAK INSULATOR.



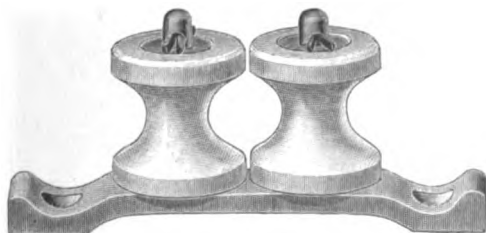
No. 898.	Per 100, small size.....	\$10.00
No. 899.	Per 100, large size.....	14.00

## TREE INSULATOR.



No. 2426.	Per dozen.....	\$4.20
-----------	----------------	--------

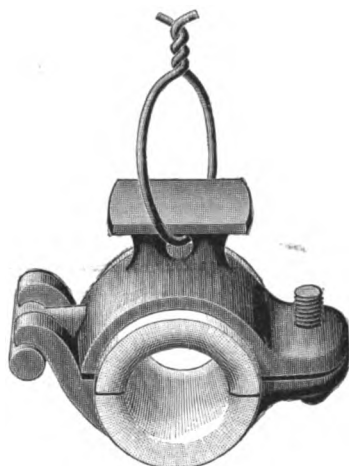
## SIMPLEX TREE INSULATOR.



No. 2427.	Per dozen.....	\$3.00
-----------	----------------	--------

## FLETCHER'S "TREE" WIRE HOLDER.

Opalescent Glass Insulation—Flanged at ends.



(Patented.)

By passing a wire through the hole in boss of the "Tree" Wire Holder, it may be adjusted to any desired position.

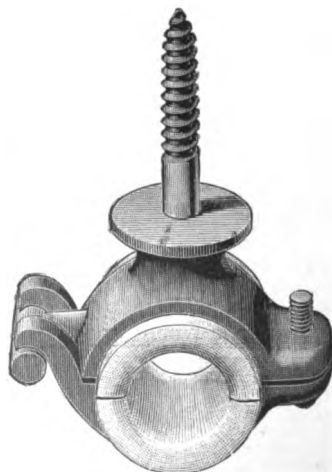
No. 492. 1 in. opening, per 100, \$25.00

## FLETCHER'S "JUMBO" WIRE HOLDERS.

Opalescent Glass Insulation.

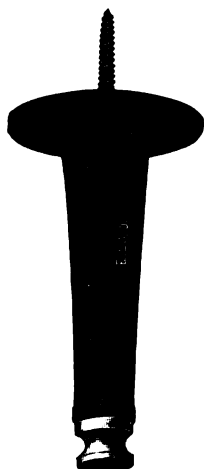
The Fletcher "Jumbo" Wire Holders are especially desirable where heavy insulated cables are used. They are sufficiently strong to support the heaviest cable made, and add materially to the beauty of the construction.

No. 491.	1	in.	opening,	per 100,	\$25.00
" 493.	1	$\frac{1}{4}$	" "	"	50.00
" 494.	1	$\frac{1}{2}$	" "	"	60.00

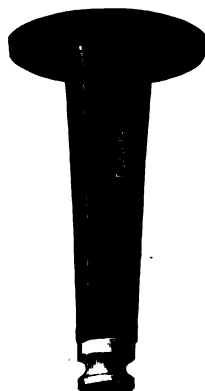


(Patented.)

## THE FLETCHER WIRING PENDANTS.



No. 3916.



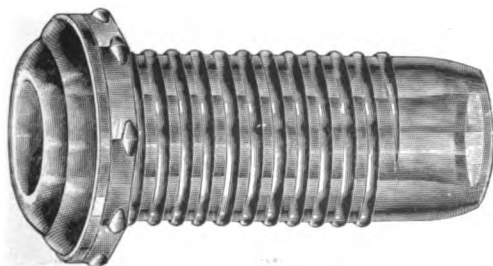
No. 3917.

A neat and strong device for wiring Arc or Incandescent Lamps, indoors or out. Length, 5 inches. Diameter of base plate, 3 inches. Each Pendant is supplied with a Porcelain Knob with groove large enough to take any ordinary size wire.

No. 3916.	Fletcher's Wiring Pendant with screw.....	each, \$0.15
" 3917.	" " " " screw holes.....	" .15

## GLASS FLOOR INSULATOR.

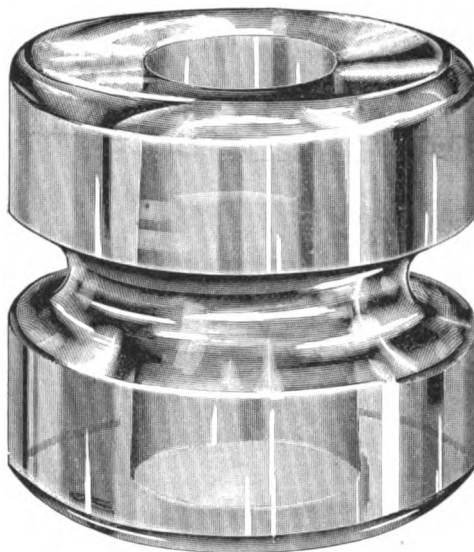
Also used as a Window Tube for heavy wires.



No. 910.	3 inch.....	each, \$0.12½
" 1189.	6 ".....	" .20

## GLASS INSULATING KNOBS.

Unlike porcelain, the insulating qualities will not be damaged should the insulators be cracked or broken. Recommended for damp places.



No. 1461. Per 1,000..... \$40.00

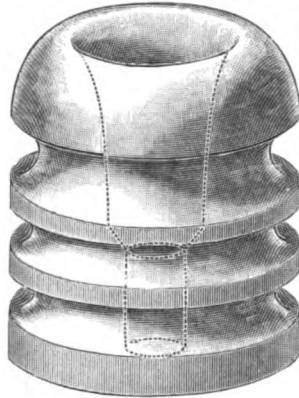


No. 1462. Per 1,000..... \$25.00

## PORCELAIN INSULATOR.

**HIGH INSULATION.**

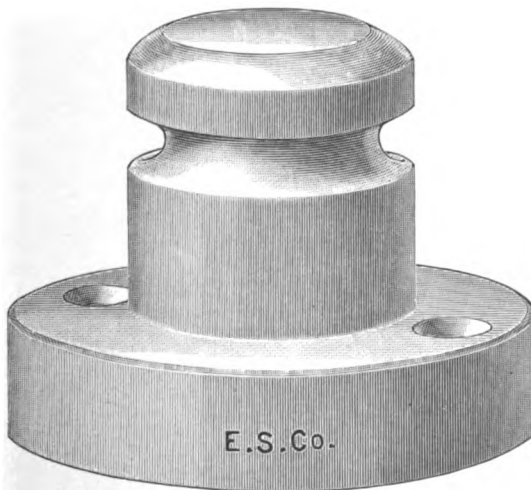
**E. S. Co.'s Special Design.**



*This insulator will work perfectly where the ordinary porcelain insulator fails.* It has external corrugation, which increases the effective distance between the wire and the support, and the screw head is placed near the bottom of the insulator in a deep depression, so that leakage from the wire to the head of the screw is practically eliminated. We recommend these insulators particularly for work in Tanneries, Dye Houses, Breweries, etc., as well as for outdoor work, where the use of porcelain is permissible.

No. 1086.	Small, per 1,000.....	\$25.00
" 1085.	Large, per 1,000.....	37.50

## PORCELAIN INSULATOR.



**Base is countersunk and has two holes for screws.**

No. 1295.	Per 1,000.....	\$45.00
-----------	----------------	---------

# PORCELAIN INSULATORS.

Cuts Full Size.



No. 986. Per 1,000.....\$200.00



No. 961. Per 1,000.....\$40.00

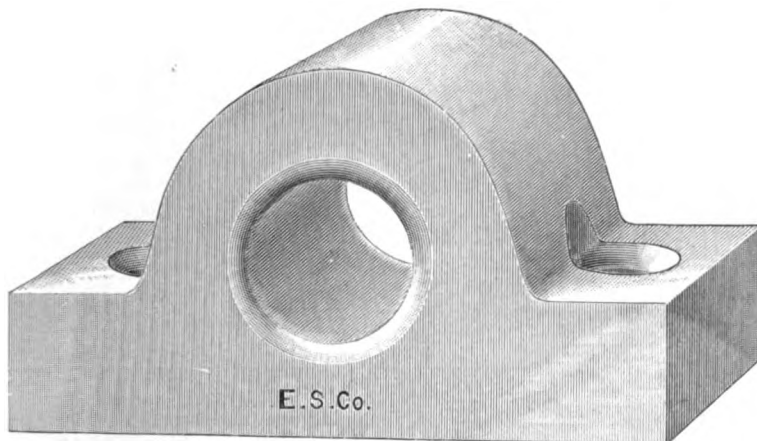


No. 966. Per 1,000.....\$40.00

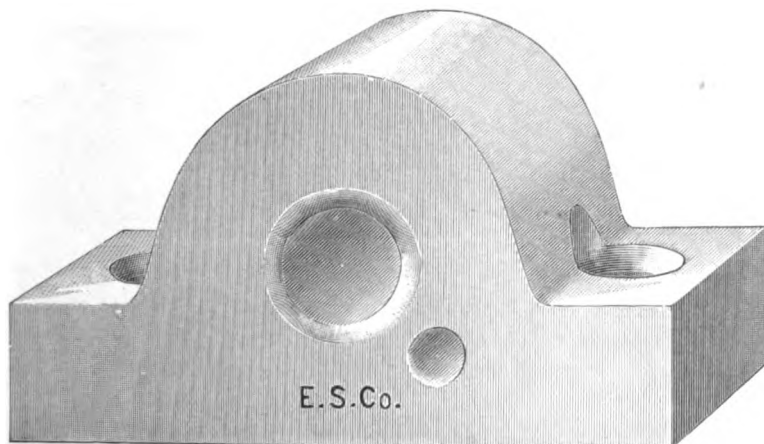
# PORCELAIN INSULATORS

*Continued.*

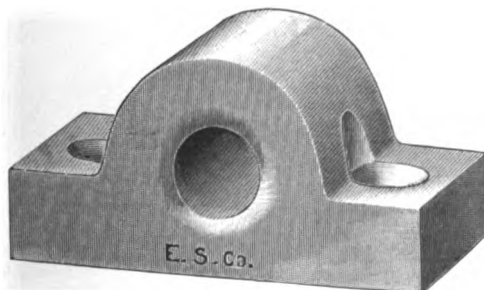
**Cuts Full Size.**



No. 976. Per 1,000..... \$120.00



No. 979. Per 1,000..... \$120.00



No. 980. Per 1,000..... \$ 35.00

# PORCELAIN INSULATORS

*Continued.*

**Cuts Full Size.**



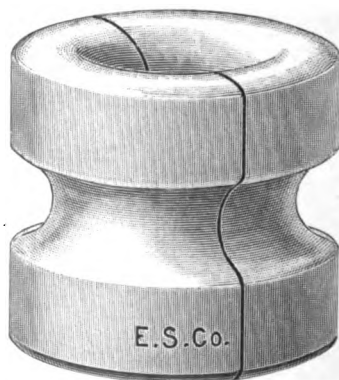
No. 967. Per 1,000.....\$80.00



No. 983. Per 1,000.....\$22.00



No. 972. Per 1,000.....\$22.00

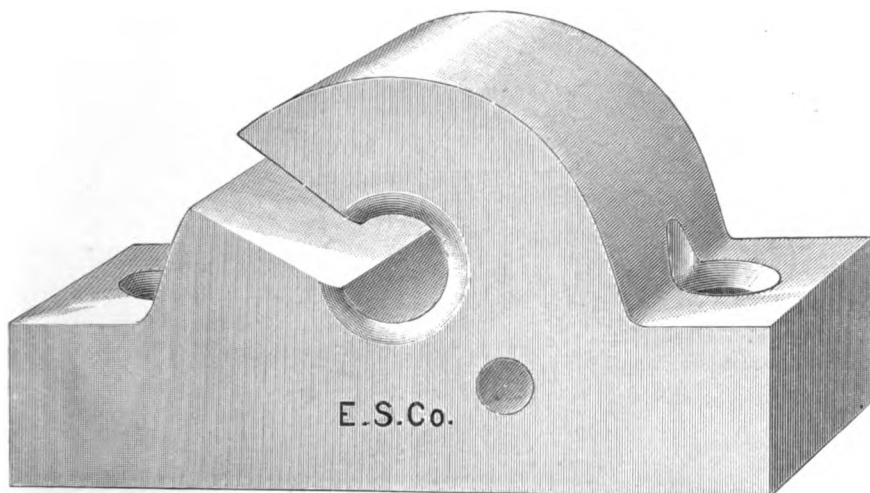


No. 970 (split). Per 1,000..\$45.00

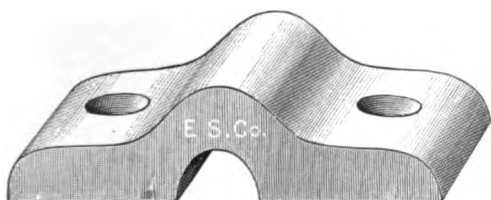
# PORCELAIN INSULATORS

*Continued.*

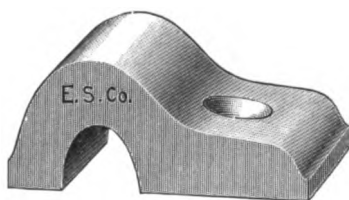
**Cuts Full Size.**



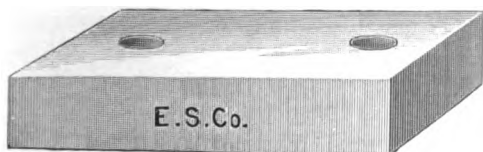
No. 977. Per 1,000 ..... \$200.00



No. 982. Per 1,000 ..... \$15.00



No. 981. Per 1,000... \$12.00



**Base for 982.**

No. 982 A. Per 1,000 ..... \$12.50



**Base for 981.**

No. 981 A. Per 1,000..... \$9.25

# PORCELAIN INSULATORS

*Continued.*

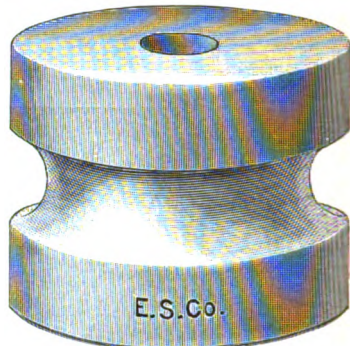
**Cuts Full Size.**



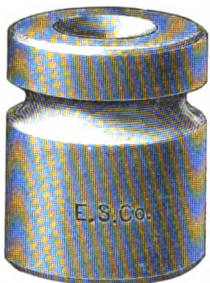
No. 962. Per 1,000....\$14.50



No. 971.  
Per 1,000, \$8.00



No. 975. Per 1,000.....\$20.00



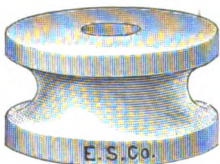
No. 963. Per 1,000...\$10.00



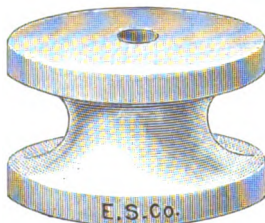
No. 964. Per 1,000...\$6.00



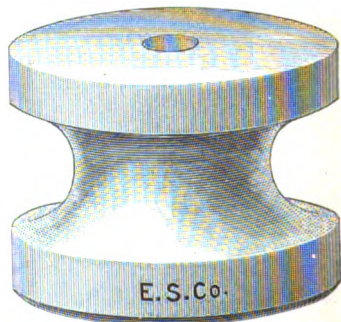
No. 965. Per 1,000...\$6.00



No. 974. Per 1,000, \$8.40

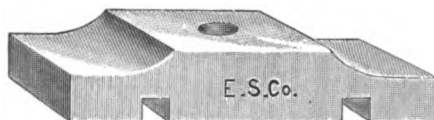


No. 973.  
Per 1,000, \$15.00



No. 968. Per 1,000.....\$22.00

## PORCELAIN CLEAT.



Cut Full Size.

No. 1060. Per 1,000 .....\$10.00

## STORAGE BATTERY INSULATOR.



No. 1061. Per 1,000 .....\$45.00

# SHIELD BRAND MOISTURE-PROOF LINE WIRE.



## REGULAR INSULATION.



Trade No. 44.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,950 lbs.	748 lbs.	\$0.45	5	705 lbs.	184 lbs.	\$0.44
000	3,285 "	632 "	.45	6	600 "	114 "	.44
00	2,555 "	484 "	.44	8	445 "	84 "	.45
0	2,090 "	396 "	.44	10	255 "	49 "	.48
1	1,620 "	307 "	.44	12	170 "	32 "	.50
2	1,280 "	242 "	.44	14	110 "	21 "	.52
8	1,015 "	192 "	.44	16	70 "	18 "	.54
4	860 "	163 "	.44	18	60 "	11 "	.58

## SPECIAL INSULATION.



Trade No. 45.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	4,142 lbs.	784 lbs.	\$0.47	3	1,073 lbs.	203 lbs.	\$0.46
000	3,487 "	660 "	.47	4	924 "	175 "	.46
00	2,699 "	511 "	.46	5	764 "	144 "	.46
0	2,225 "	421 "	.46	6	660 "	125 "	.46
1	1,715 "	324 "	.46	8	505 "	95 "	.47
2	1,353 "	256 "	.46				

For full list of Shield Brand Insulation see pages 6 to 9.

## SHIELD BRAND MOISTURE-PROOF LINE WIRE.



STRANDED CONDUCTORS.



Trade No.	Number of Wires.	Size of Wires.	Equivalent in Carrying Capacity.	Approximate Weight per 1,000 Feet.	Approximate Weight per Mile.	Price per Pound.
181	49	14	0000 B. & S.	753 lbs.	3,975 lbs.	\$0.50
182	41	14	000 "	587 "	3,099 "	.50
183	42	15	00 "	465 "	2,455 "	.50
191	39	16	0 "	365 "	1,927 "	.50
194	49	21	4 "	153 "	808 "	.60
176	7	14	6 "	115 "	607 "	.50
186	21	19	6 "	118 "	623 "	.55
196	49	28	6 "	120 "	634 "	.65
198	49	25	8 "	74 "	391 "	.65
170	28	25	10 "	82 "	169 "	.65

Larger Sizes to Order.

## SHIELD BRAND HARD-DRAWN COPPER WIRE.

Trade No. 48.

No. 10 B. & S.	.....	per pound, \$0.48
" 12 "	.....	" " .50
" 14 "	.....	" " .52
" 16 "	.....	" " .54

## SHIELD BRAND PRESSURE WIRE.

FOR USE IN INCANDESCENT WORK.

Trade No. 49.

Extra B. B. Galvanized Iron Wire covered with Shield Brand Insulation.

No. 10 W. & M. Gauge (No. 7½ B. & S.)	.....	per pound, \$0.22
" 12 " " ( " 10 " )	.....	" " .28
" 14 " " ( " 12 " )	.....	" " .37

# P. & B. WEATHER-PROOF LINE WIRE.



Trade No. 41.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,739 lbs.	708 lbs.	\$0.42	6	505 lbs.	95 lbs.	\$0.40
000	3,115 "	590 "	.42	7	415 "	78 "	.42
00	2,425 "	459 "	.40	8	344 "	65 "	.42
0	1,895 "	359 "	.40	10	241 "	45 "	.44
1	1,491 "	282 "	.40	12	146 "	27 "	.46
2	1,180 "	223 "	.40	14	100 "	19 "	.48
3	940 "	178 "	.40	16	65 "	12 "	.52
4	758 "	143 "	.40	18	43 "	8 "	.56
5	620 "	117 "	.40				

Our trade mark (registered) is placed on all tags of P. & B. Weather-Proof Line Wire. None genuine without it.

# UNDERWRITERS LINE WIRE.



Trade No. 39.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,960 lbs.	750 lbs.	\$0.42	6	575 lbs.	109 lbs.	\$0.40
000	2,957 "	560 "	.42	8	390 "	74 "	.42
00	2,600 "	492 "	.40	9	300 "	57 "	.44
0	1,990 "	376 "	.40	10	285 "	54 "	.44
1	1,600 "	303 "	.40	12	180 "	35 "	.46
2	1,270 "	241 "	.40	14	110 "	21 "	.48
3	1,025 "	195 "	.40	16	74 "	14 "	.52
4	880 "	167 "	.40	18	64 "	12 "	.56
5	720 "	136 "	.40				



## STANDARD INSULATION.



## Solid Conductors—Taped.

H. 150.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.
	B. & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
T 184	18	4	2½	T 412	4	12	15½
T 166	16	6	2½	T 313	3	13	18
T 146	14	6	3½	T 214	2	14	23½
T 127	12	7	4½	T 114	1	14	31½
T 108	10	8	6½	T 015	0	15	41
T 810	8	10	8½	T 00	00	21	55
T 610	6	10	11½	T 000	000	22	63
T 510	5	10	13½	T0000	0000	23	80

## STANDARD INSULATION.



## Solid Conductors—Braided.

H. 151.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.
	B. & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
B 184	18	4	2¾	B 412	4	12	16
B 166	16	6	3	B 313	3	13	18½
B 146	14	6	3¾	B 214	2	14	24½
B 127	12	7	5	B 114	1	14	32½
B 108	10	8	6½	B 015	0	15	43
B 810	8	10	8½	B 00	00	21	57
B 610	6	10	12	B 000	000	22	65
B 510	5	10	14	B0000	0000	23	85

We carry in stock all sizes colored, and Nos. 12, 14, and 16 white.  
For full list of Habirshaw Insulation see pages 12 to 27.



FLAME-PROOF.



Solid Conductors—Braided—White.

H. 153.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.
	B. & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
F. P. 184	18	4	2½	F. P. 412	4	12	16
F. P. 186	16	6	3	F. P. 318	8	18	18½
F. P. 146	14	6	3½	F. P. 214	2	14	24½
F. P. 127	12	7	5	F. P. 114	1	14	32½
F. P. 108	10	8	6½	F. P. 015	0	15	43
F. P. 810	8	10	8½	F. P. 00	00	21	57
F. P. 610	6	10	12	F. P. 000	000	22	65
F. P. 510	5	10	14	F. P. 0000	0000	23	85

STANDARD INSULATION.



Stranded Conductors—Braided.

H. 154.

Trade No.	Gauge.	Strands.	(M)	Approx. Outside Diameter.	Price per Foot Braided.
	B. & S.	Size of Wire.	Cir. Mils.	32ds.	Cents.
S. B. 718	8	7-18 B.W.G.	16,807	12	10½
S. B. 716	6	7-16 "	29,575	14½	17½
S. B. 715	5	7-15 "	36,328	14½	19½
S. B. 714	4	7-14 "	48,223	15½	24½
S. B. 711	3	7-11 B.&S.	57,638	16½	29½
S. B. 1917	2	19-17 B.W.G.	63,916	17	32½
S. B. 1916	1	19-16 "	80,275	18½	36
S. B. 1915	0	19-15 "	101,000	19½	47½
S. B. 1914	00	19-14 "	130,891	21½	60
S. B. 1911	000	19-11 B.&S.	156,446	22½	68
S. B. 1912	0000	19-12 B.W.G.	225,739	23½	88

For full list of Habirshaw Insulation see pages 12 to 27.



## HABIRSHAW SPECIAL CORES.

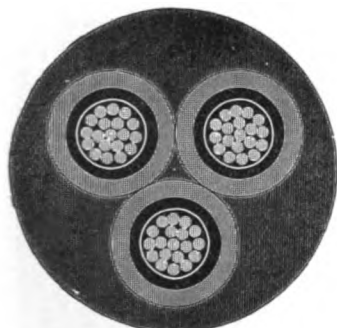


Fig. 1.

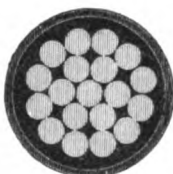


Fig. 22.

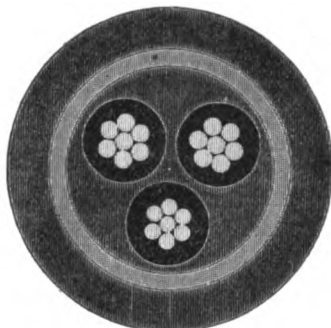


Fig. 3.



Fig. 15.

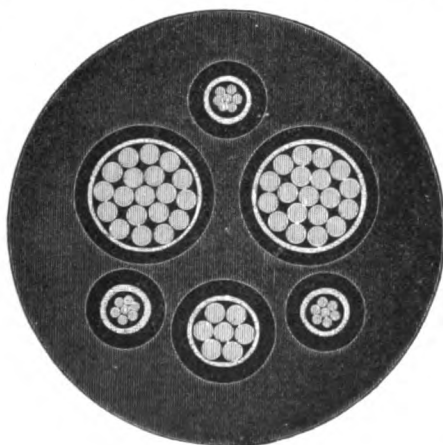


Fig. 5.



Fig. 17.

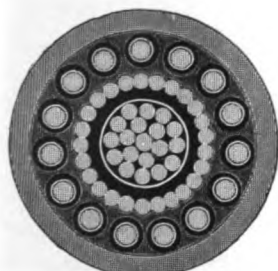


Fig. 16.



Fig. 19.



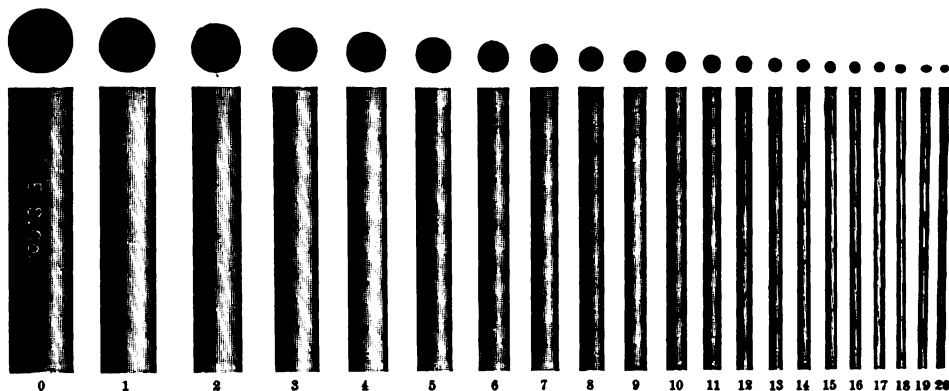
Fig. 8.

For description of Habirshaw Special Cores, see pages 22 and 23.

For full list of Habirshaw Insulation, see pages 12-27.

## COPPER WIRE.

EITHER SOFT OR HARD DRAWN.



These cuts represent exact sizes by Brown &amp; Sharpe's Gauge.

Nos. B. & S.	Coils.	5 and 10 lb. Spools.	1 lb. Spools.	Nos. B. & S.	Coils.	5 and 10 lb. Spools.	1 lb. Spools.
0000 8	\$0.30	-----	-----	27	\$0.62	-----	\$0.82
9-14	.31	-----	-----	28	.67	-----	.87
15, 16	.32	\$0.42	-----	29	.73	-----	.93
17, 18	.33	.43	-----	30	.82	-----	1.02
19, 20	.34	.44	-----	31	.95	-----	1.20
21	.35	.45	\$0.55	32	1.30	-----	1.55
22	.38	.48	.58	33	1.50	-----	1.75
23	.40	.50	.60	34	1.70	-----	2.00
24	.43	.53	.63	35	2.00	-----	2.30
25	.46	.56	.66	36	3.25	-----	3.60
26	.54	-----	.74				

In filling orders we will understand that soft drawn is wanted when not specified to the contrary.

Our Electrical Copper Wire is manufactured from Selected Lake Superior Refined Copper, made especially for our own work, and will be found uniform in gauge, and of exceptionally high conductivity and tensile strength.

## MCINTIRE CONNECTORS.

### LONG TWIST CONNECTORS.

With the McIntire Connectors resistance at joints is overcome. The joint is good for all time, is but little larger than the wire, and is neat in appearance.



For Hard-Drawn Copper Wire.

For hard-drawn copper wire longer connectors are used to insure the full tensile strength of the wire.

No. 425.	For No. 6 B. & S.	.....	per 100, \$19.15
" 426.	" " 8 "	.....	" " 15.80
" 427.	" " 10 "	.....	" " 11.65
" 428.	" " 12 "	.....	" " 11.65

### TWIST CONNECTORS.

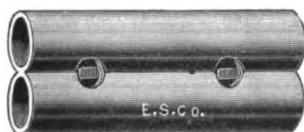


For Electric Light Wires.

For wires No. 0 to 4, 4 to 8, and 8 to 16, a set (consisting of two pairs) of clamps are used to twist the connectors. These are clamped over the connectors close to the end, and two to four turns or twists are sufficient to make a strong, handsome joint.

No. 429.	For No. 4 B. & S.	.....	per 100, \$15.00
" 430.	" " 6 "	.....	" " 13.30
" 431.	" " 8 "	.....	" " 9.15
" 432.	" " 10 "	.....	" " 7.50
" 433.	" " 12 "	.....	" " 6.65
" 434.	" " 14 "	.....	" " 5.80
" 435.	" " 16 "	.....	" " 4.15

### SOLDER CONNECTORS.

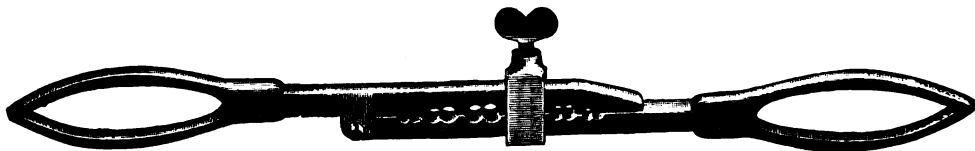


For Large Wires.

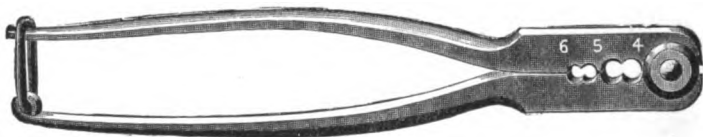
The wires are passed through the connector, the ends of the wire are riveted, then soldered, no twisting being done.

No. 436.	For No. 0000 B. & S.	.....	per 100, \$41.65
" 437.	" " 000 "	.....	" " 41.65
" 438.	" " 00 "	.....	" " 41.65
" 439.	" " 0 "	.....	" " 33.30
" 440.	" " 1 "	.....	" " 33.30

## MCINTIRE TWISTING CLAMPS.



No. 1726. Nos. 00 to 6 wire, per set of two pairs .....\$11.00



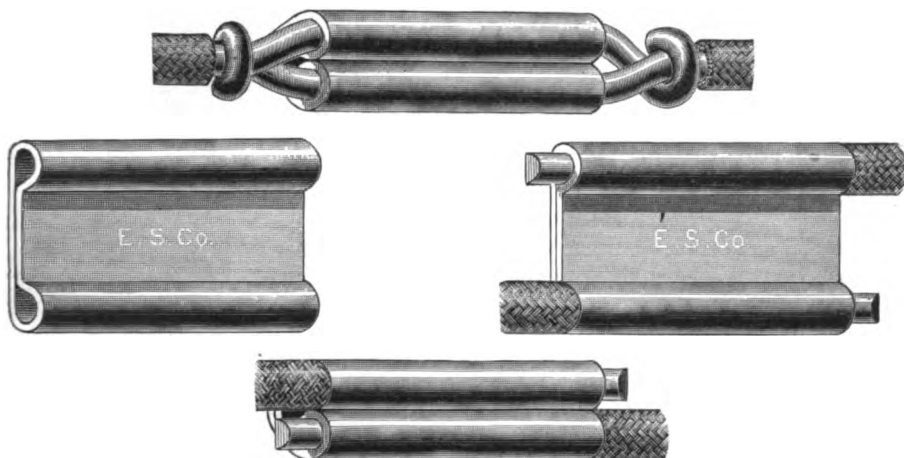
No. 1727. Nos. 4, 5, 6 wire, per set of two pairs .....\$6.00



No. 1728. Nos. 8 to 16 wire, per set of two pairs .....\$4.75

## THE HERING VISE-GRIP COUPLINGS.

Patented.



This wire coupling embodies the advantages of all first-class wire joints, by a clamp that operates upon a simple mechanical principle. When adjusted, it forms a positive grip on all sides of the wire. The cuts illustrate the method of operation of this coupling. The wire and clamps are virtually welded together, and so simple and rapid is the operation that there is a great saving of time over that required to make the usual "twist joint."

No special tools are required to adjust them; ordinary pliers for the small and a hammer for the larger wires are the only implements necessary. The clamps are adapted alike for Electric Light, Telephone and Telegraph Wires.

No. 484, for No. 4 B. & S. Wire .....	each, \$0.08
" 485, " " 5 " " .....	" .07
" 486, " " 6 " " .....	" .07

## THE AYER SPRING CONNECTOR.



This spring clip is designed for making contact on Arc Lamps which require to be raised and lowered. Every one familiar with the running of Arc Lamps knows the liability to trouble where lamps swing and gradually loosen the contact between lamp and wire. This clip exerts a constant spring pressure on the contact, and permits of considerable motion without any possibility of a loose contact occurring. It will carry 10 amperes with perfect safety. It is also useful for temporary splices between wires, and for testing purposes.

No. 475 .....	each, \$0.30
---------------	--------------

## CONNECTORS.

For Temporary Work.



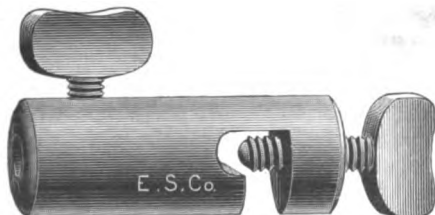
No. 400.	For No.	0	B. & S. wire	.....	each, \$0.12
" 401.	"	1 and 2	" "	.....	" .10
" 402.	"	3 " 4	" "	.....	" .09
" 403.	"	5 " 6	" "	.....	" .08
" 404.	"	7 " 8	" "	.....	" .08
" 405.	"	9 " 10	" "	.....	" .07
" 406.	"	11 " 12	" "	.....	" .06



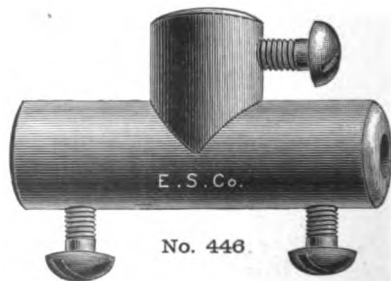
No. 412.	For Nos.	3 and 4	B. & S. wires	.....	each, \$0.09
" 413.	"	5 " 6	" "	.....	" .08½



No. 420.	For No.	0	B. & S. wire	.....	each, \$0.12
" 421.	"	1 and 2	" "	.....	" .10
" 422.	"	3 " 4	" "	.....	" .09
" 423.	"	5 " 6	" "	.....	" .08



No. 441.



No. 446.

No. 441.	For No.	4	B. & S. wire and finer	.....	each, \$0.20
" 446.	" 3 " 4	"	wires	.....	" .20

## KERITE TAPE.



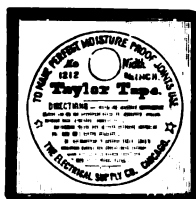
- No. 1201. In rolls (about 1 lb. each),  $\frac{3}{4}$  in. wide, per roll.....\$1.40  
 “ 1203. On spools (convenient for linemen),  $\frac{3}{4}$  in. wide, per spool..... .40

## OKONITE TAPE.



- No. 1204. In rolls,  $\frac{3}{4}$  in. wide, per lb. ....\$1.50

## TAYLOR TAPE.



This is a soft, adhesive, black gum tape, with which it is possible to make a joint that will stand being laid in wet plaster. The joint, after being properly soldered and cleaned, should be covered with three or four over-lapping layers; then gently heated, smoothed down with the fingers, and finished by at least two coats of adhesive cotton-rubber tape.

- No. 1212. In rolls,  $\frac{3}{4}$  in. wide, per lb. ....\$1.40

## GRIMSHAW TAPE.



No. 1206.	White, per lb.	.....	\$1.00
" 1206 B.	Black, "	.....	1.10

## E. S. RUBBER TAPE.



This is a very pliable and moderately thin rubber tape, containing a fair proportion of pure rubber.

No. 1207.	White, $\frac{3}{4}$ in. wide, per lb.	.....	\$0.90
" 1207 B.	Black, $\frac{3}{4}$ in. " "	.....	.95

## MANSON TAPE.



No. 1210.	White, $\frac{3}{4}$ in. wide, per lb.	.....	\$0.90
" 1210 B.	Black, $\frac{3}{4}$ in. " "	.....	.90

## SHIELD BRAND TAPE.



A thoroughly good, moisture-proof Insulating Tape. Adhesive qualities permanent.

No. 1213. Per lb. .... \$0.65

## CHATTERTON'S INSULATING COMPOUND.



No. 1221. Per lb. .... \$3.50

## SHIELD BRAND SPLICING COMPOUND.



Will not corrode bare copper. Always pliable; never hardens. Water, gas, acid, and moisture-proof.

No. 1224. Per stick, 12 in. .... \$0.50

## P. & B. INSULATING COMPOUND.



This Compound is required in all work where dampness is likely to be encountered. Its insulating qualities are unexcelled.

No. 1231. Light body. Will dry rapidly, and is very penetrating. Its main use is on fibrous materials.

No. 1232. Medium body. Is the brand generally used as a paint for insulating purposes.

No. 1233. Heavy body. Used for underground work.

Trade No.	Barrel Lots, per gallon.	Five-Gallon Cans, per gallon.	One-Gallon Cans, per gallon.
1231	\$2.25	\$2.40	\$2.62½
1232	1.87½	2.10	2.25
1233	1.50	1.65	1.80

## P. & B. ARMATURE VARNISH.



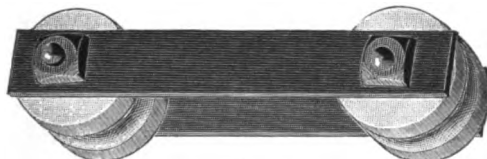
This Varnish makes an unexcelled finish for armatures or field magnets.

No. 1239. In gallon cans, per gallon .....\$5.10  
In barrel lots, " ..... 4.50

**HERCULES CIRCUIT BREAK.**

Combines strength and neat appearance with high insulation.

No. 2475 .....each, \$1.50

**CIRCUIT LOOP BREAK.**

No. 958 .....each, \$0.35

**LAMP CROSS ARM.**

No. 1096 .....each, \$0.30

**LAMP CROSS ARM.**

No. 1097 .....each, \$0.20

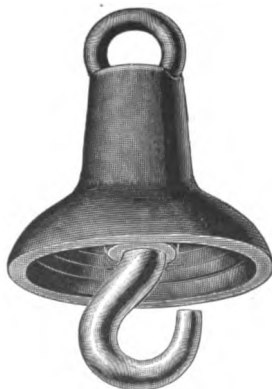
## FLETCHER S LAMP HANGER.

Patented.



No. 952 ..... each, \$0.50

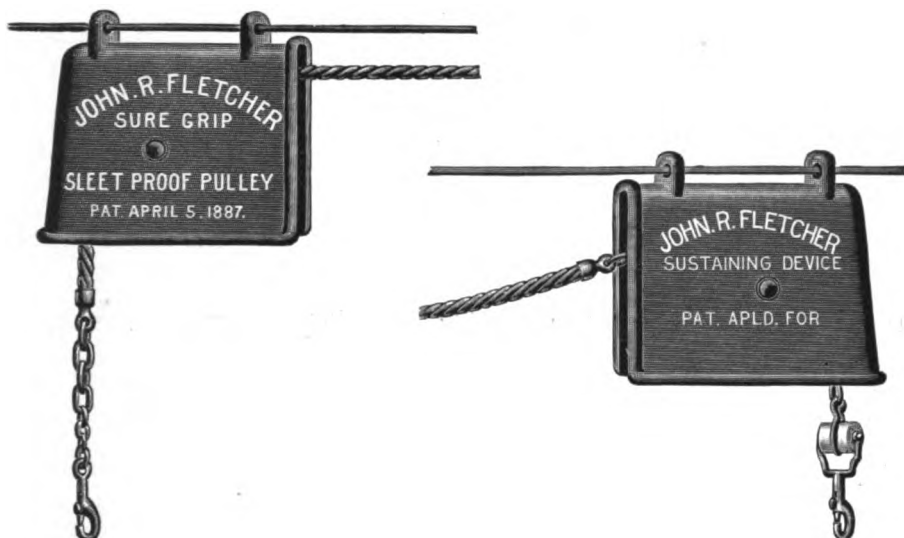
## WIRT ARC LAMP INSULATING HOOK.



A strong lamp hanger of *very high insulating qualities*. Hard rubber, with metal shell and skirt.

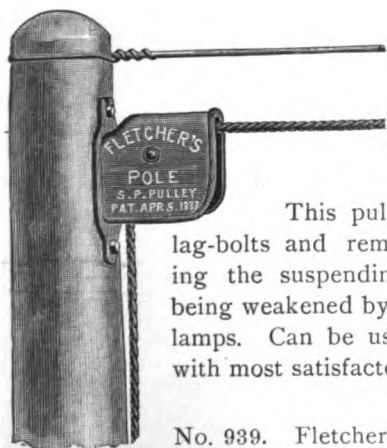
No. 989 ..... each, \$1.25

## FLETCHER'S SLEET-PROOF "SURE GRIP" LAMP SUPPORT.



The frequent accidents with falling lamps, sometimes causing injury to persons and always damage and loss of property, calls for some arrangement which will practically remove all liability of danger. This has been fully met in the device shown. Fletcher's "Sure Grip" Sleet-Proof Pulley is simple and positive in operation and will catch and hold the lamp securely in position. Does not require repeated attempts to make it work. There is no extra strain or pull on the rope and all weight is removed from every part of the rope as soon as the lamp is in position. It is impossible to wear it out by wind swinging and chafing.

No. 960. Fletcher's "Sure Grip" Lamp Support.....each, \$1.50



## FLETCHER'S SLEET-PROOF POLE PULLEY.

This pulley is secured to the pole with two small lag-bolts and remains firmly in the desired position, relieving the suspending cable from all strain and prevents its being weakened by continued wear in raising and lowering the lamps. Can be used with Arc or Street Incandescent lamps with most satisfactory results.

No. 939. Fletcher's Sleet-Proof Pole Pulley.....each, \$0.50

# FLETCHER'S SLEET-PROOF PULLEYS.

Patented.

**MIDGET.**



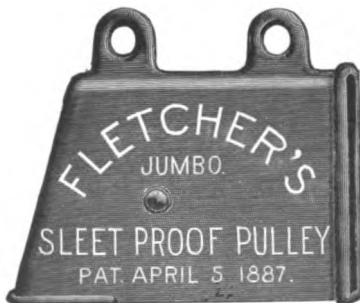
No. 954. For Municipal Lights ..... each, \$0.50

**MEDIUM.**



No. 953. For Ordinary Arc Lights ..... each, \$0.75

**JUMBO.**

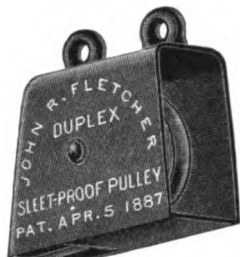


No. 955. For Extra Heavy Arc Lights ..... each, \$1.00

# FLETCHER'S SLEET-PROOF PULLEYS

*Continued.*

## DUPLEX.



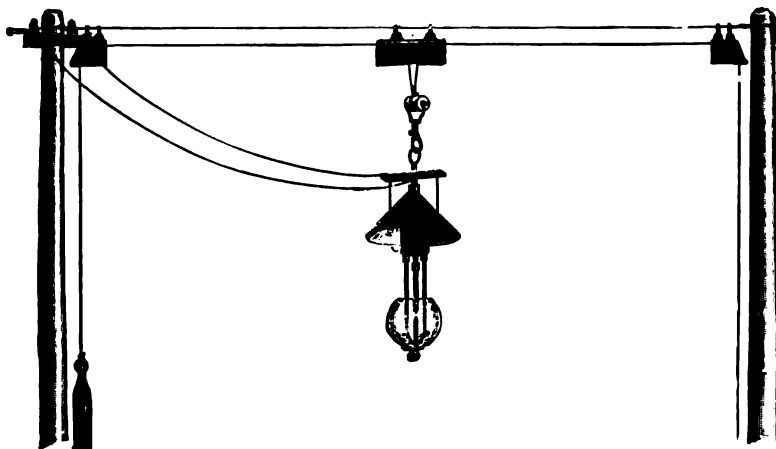
No. 956 ..... each, \$1.00

This Pulley is for use when it is desired to use two ropes in drawing up lamp.

## TWIN.



No. 957 ..... each, \$1.50



This cut shows the proper use of the Twin Pulley. To one cord there should be attached a balancing sash-weight, from five to eight pounds lighter than lamp.

## THE DAYTON ARC LIGHT CUT-OUT.

(Patented.)

The Dayton Arc Light Cut-Out is double pole in its construction—cuts the lamp into circuit before the circuit opens, and closes the circuit above the lamp before lamp is dropped from hood.

It is invaluable where lamps are to be suspended in an elevated position in front of theatres, hotels, or public buildings.

Sash cord is only used in raising and lowering.

Sash cord is relieved of weight of lamp when in position.

Lamp is held in place by a half-inch iron bolt, and can not fall.

Lamp is released instantly and promptly at will of trimmer.

*The moment lamp starts down it is out of circuit.*

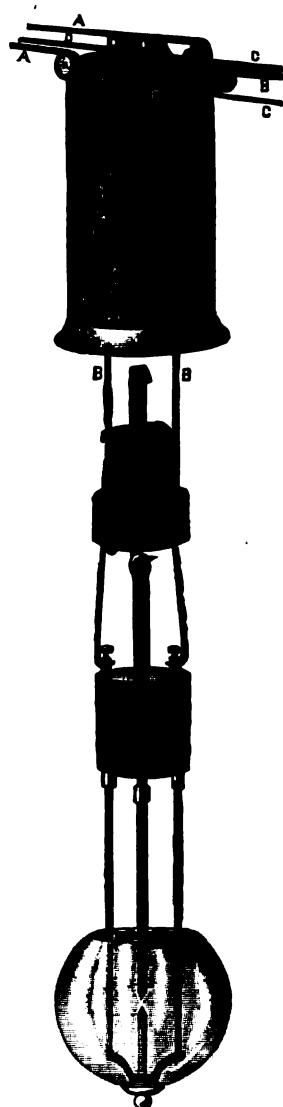
No deadly loop wires obstruct the streets.

An open circuit is an impossibility.

Lamps in trouble can be changed without danger to operator.

*Drops lamps safely between electric street railroad wires.*

Can be attached to single or double rod lamps of any system.



- A A Current Wires.
- B B Sustaining Ropes or Cords.
- C Release Cord attached to Bolt.
- D D Sustaining Wire to which Hood is attached.
- B B (Below Hood) Sustaining Ropes attached to Cut-Out Block.

No. 951. Complete.....each, \$10.00

## INSIDE LAMP PULLEYS.



No. 1053.



No. 1057.

- No. 1053. Japanned, for  $\frac{3}{8}$  and  $\frac{1}{4}$  inch rope, swivel eye.....each, \$0.30  
 “ 1057. Galvanized Iron, for  $\frac{3}{8}$  inch rope, fast eye..... “ .30

## OUTSIDE LAMP PULLEYS.



No. 1058.



No. 1067.

- No. 1058. For  $\frac{3}{8}$  inch rope, swivel eye,  
galvanized .....each, \$0.30  
 No. 1067. Wood; pat. rolls; iron strap,  
for  $\frac{3}{8}$  and  $\frac{1}{4}$  inch rope.....each, \$2.00

## INDOOR LAMP CLEAT.



- No. 1019. Japanned Iron.....per doz., \$1.20

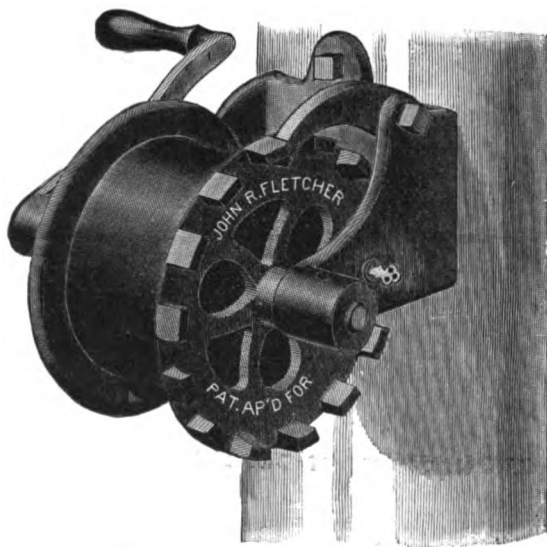
## OUTDOOR LAMP CLEAT.



- No. 1020. Japanned Iron.....per doz., \$3.00

## THE FLETCHER SAFETY WINDLASS.

Patented.



No cumbersome padlock is required, but windlass is safely locked with key weighing less than half an ounce.

The handle is so arranged that it cannot slip off, but is removed easily when not in use.

Only one handle necessary for each trimmer.

- No. 1048. Fletcher's Safety Windlass (takes 35 feet iron flexible cord), without crank ..... each, \$3.50
- No. 1049. Fletcher's Safety Windlass (takes 75 feet flexible iron cord or 40 feet rope), without crank ..... each, 4.00
- No. 1048½. Handle (or crank) for either above Windlasses ..... " 1.00

## GALVANIZED STEEL WIRE STRANDS.



For suspending Arc Lamps across streets.

Trade No.	Diameter in Inches.	Weight per 100 Feet. Lbs.	Estimated Breaking Strain. Lbs.	Price per 100 Feet.
1109	$\frac{1}{2}$	50	10,000	\$5.40
1110	$\frac{3}{8}$	29½	6,300	3.30
1111	$\frac{1}{4}$	12	2,300	1.40
1112	$\frac{3}{16}$	7	1,500	1.00

## GALVANIZED IRON LAMP CORD.

FOR USE WITH PULLEYS.—FLEXIBLE.



Trade No. 1125.	Diameter $\frac{5}{16}$ inch,	per 100 feet.....	\$3.50
“ “ 1126.	“ $\frac{1}{4}$ “ “ 100 “ .....		3.00
“ “ 1127 $\frac{1}{2}$ .	“ $\frac{1}{2}$ “ “ 100 “ .....		2.00

## ARC LAMP CORDAGE.

**BRAIDED COTTON.**



**For Inside Work.**

No. 1135.	$\frac{3}{8}$ in.,	per 100 ft....	\$3.00
“ 1137.	$\frac{1}{4}$ “ “ 100 “ ...		1.65

**Treated—Making Weather-proof.**



**For Outside Work.**

No. 1113.	$\frac{1}{2}$ in.,	per 100 ft....	\$3.30
“ 1114.	$\frac{7}{16}$ “ “ 100 “ ...		2.70

## PURE MANILLA ROPE.

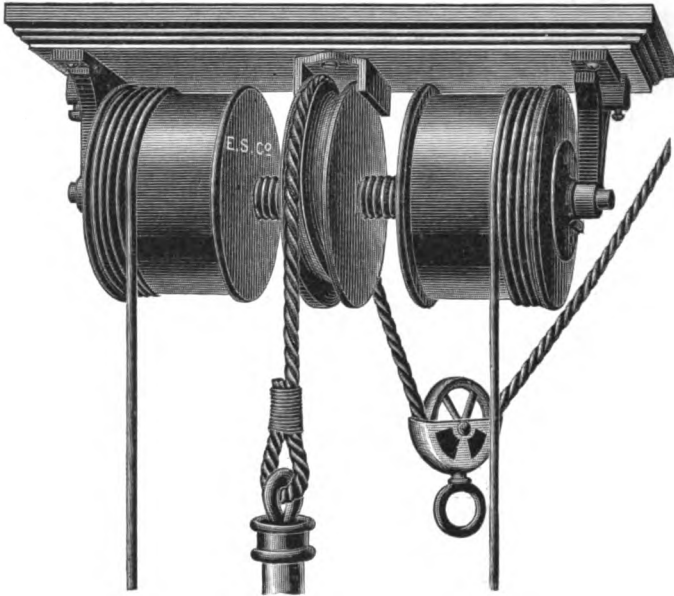


Used in raising and lowering Arc Lamps. For either inside or outside work.

Trade No.	Diameter.	Weight of 1,000 Feet.	Number of Feet in One Pound.	Strength of New Manilla Rope.	Price per Pound.
4340	$\frac{1}{2}$ inch.	23 lbs.	43	450 lbs.	\$0.30
4342	$\frac{3}{8}$ “	42 “	24	950 “	.30
4344	$\frac{1}{4}$ “	74 “	13 $\frac{1}{2}$	1,700 “	.30

## THE "E. S." ARC LIGHT HANGER.

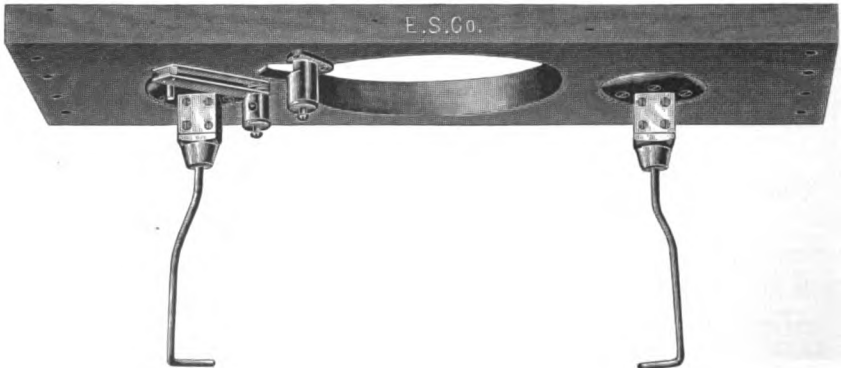
For Suspending Arc Lamps From Ceiling.



The valuable feature about this Hanger is that *the lamp is not supported by the circuit wires*. The latter will not therefore break as is often the case with other hangers. It is simple and has no catches to wear out or break.

No. 1095 .....each, \$10.00

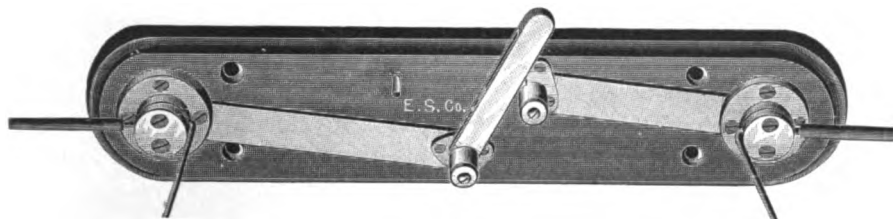
## ARC LAMP SUSPENDING BOARDS.



No. 817 .....each, \$4.00

## ARC LAMP SUSPENDING BOARDS

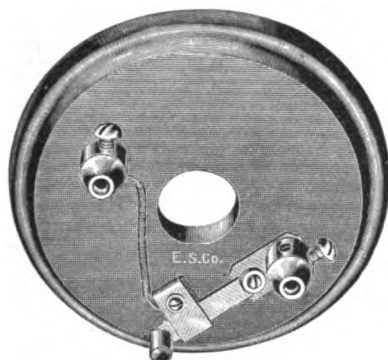
FOR OUTSIDE FRAME LAMP.



No. 818.....each, \$4.00

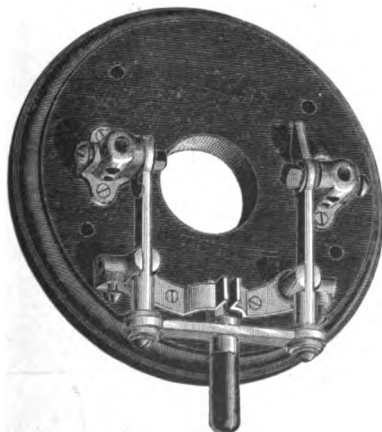
## CEILING SUSPENDING BOARD

FOR INSIDE FRAME LAMP.



No. 814.....each, \$2.50

## ARC LAMP CEILING SWITCH.



This switch entirely cuts out the loop, leaving it safe to handle while the current is passing on the main wires. The circuit is not opened at any time; the switch is therefore non-sparking.

There being no lateral motion, it can be operated directly from the floor by a hook, and the current thrown on or off without inconvenience.

No. 813. For either 10 or 20 ampere.....each, \$3.50

## RAPID TRANSIT ARC SWITCHES.

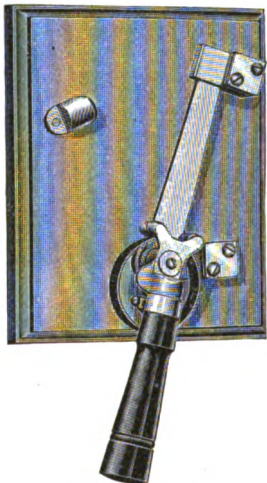
**RATED 40 AMPERE.**

These switches are very rapid, with powerful snap action.

The movement is positive, not depending on the spring. The lever is securely locked in either position, making it impossible to jar out.

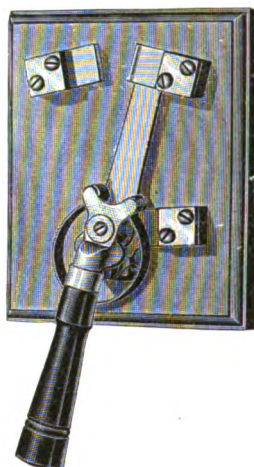
Mounted on mahogany bases and nicely finished. Slate bases furnished when specified.

**Single Point.**



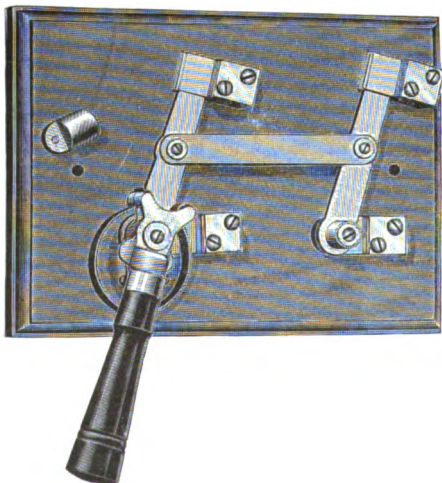
No. 1175, each, \$6.75.

**Double Point.**



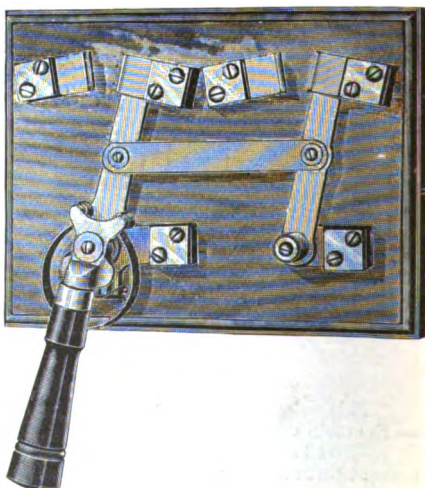
No. 1176, each, \$7.75.

**Double Pole Break Switch.**



No. 1177, each, \$8.75.

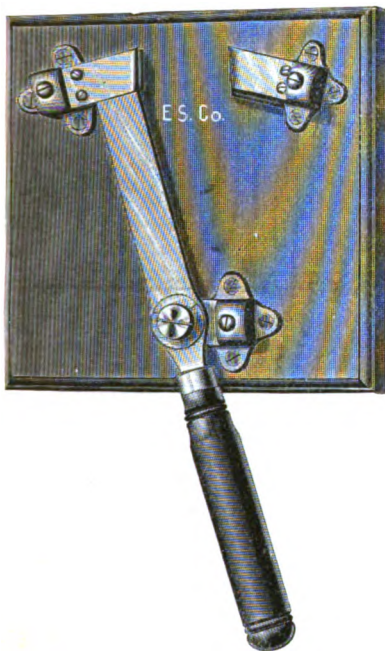
**Loop Switch.**



No. 1178, each, \$12.00.

## STRAP SWITCH.

For Arc Use.



No. 821. 1-point.....each, \$4.00

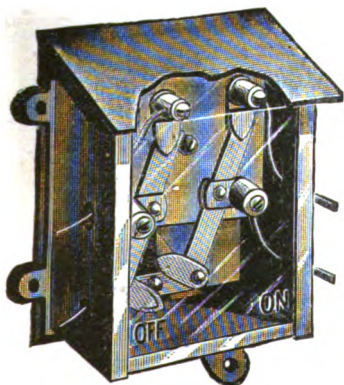
No. 822. 2-point.....“ 4.25

## LOOP SWITCH.

For Arc Use.



No. 810.....each, \$4.00



## CLEVELAND ARC CUT-OUT.

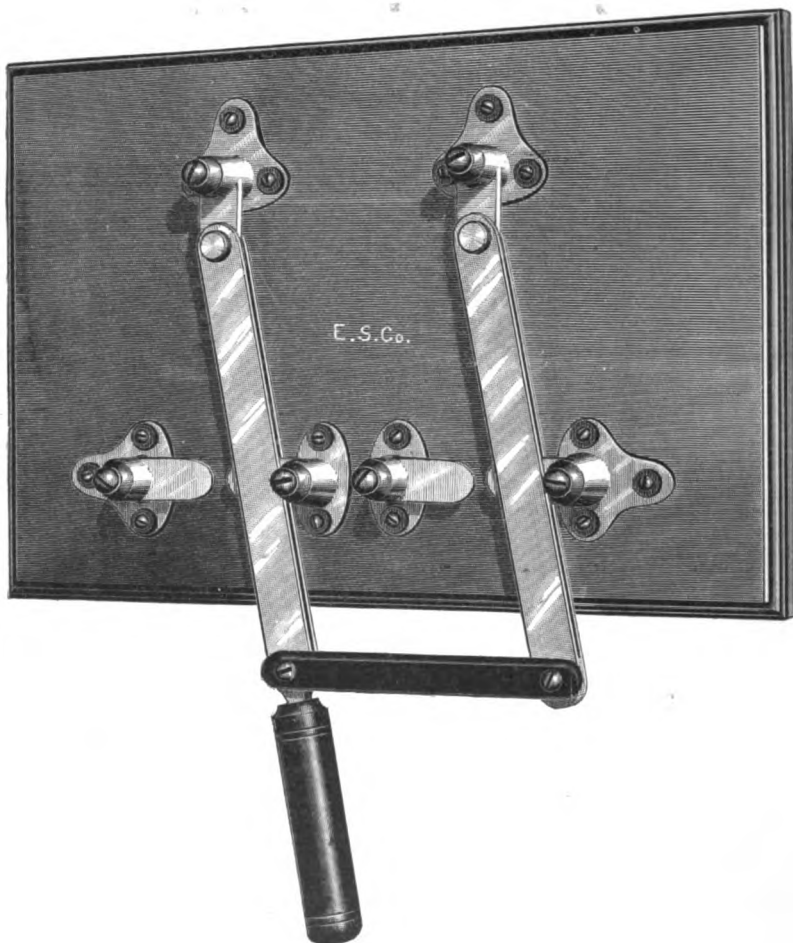
Patented.

Non-Sparking.

No. 811.....each, \$3.50

## DOUBLE STRAP SWITCH.

FOR ARC USE.

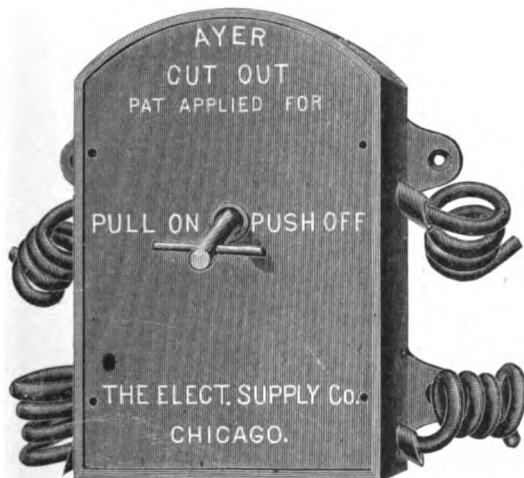


We make to order Switches to answer any requirement. Sketch circuit or state clearly what is to be accomplished, where used, and on what current, and a proper Switch will be furnished.

No. 815. Price .....each, \$9.00

## AYER ARC CUT-OUT.

IRON BOX. WEATHER-PROOF.



This Cut-out has been designed by the manager of the largest electric-light station in the world, with the one object of getting rid of the many serious troubles inherent in the ordinary arc light cut-out. The points of special excellence in the Ayer Cut-out are as follows :

1st. Perfect weather protection, secured by a solid cast-iron box perfectly weather-tight and provided with rubber insulating tubes for leading in the line wires.

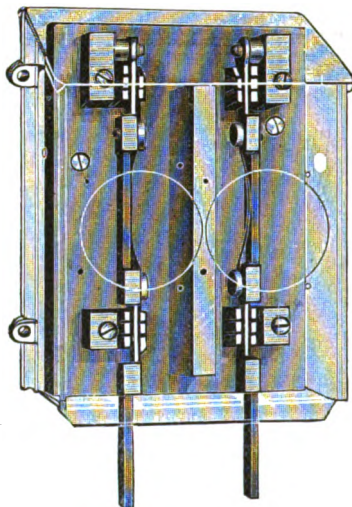
2d. The absence of binding screws, with the attendant uncertainty of contact between the line and the terminals. A short wire is soldered to the terminal and enough left projecting from the box to make a soldered joint with the line wire.

3d. Perfect contact in the switch itself, and a rapid snap break. As the expense of locating and removing a fault in a box on an arc light line is often greater than the original cost of the box itself, it is believed that every Station Superintendent will appreciate a device which is intended to eliminate just this class of trouble.

No. 809 .....each, \$6.50

## CLEVELAND TRANSFORMER CUT-OUT.

Patent Applied For.



To connect in the Primary Circuit of the Transformer as a safety against accident to life and protection to the Transformer from over load, and used where the wires enter the building with Direct Current.

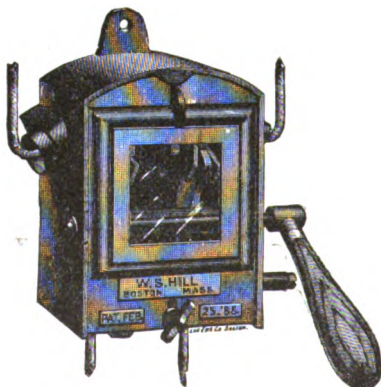
*The Primary Wires* may be connected to either the upper or lower binding posts.

*To disconnect* the Transformer, pull the handles forward.

*To replace fuses*, remove the sliding front and raise the levers to a horizontal position. They can then be detached from the contact and the fuse replaced on the lever while detached and again inserted, or extra levers with fuses can be inserted.

No. 805 ..... each, \$3.50

## DOUBLE POLE CONVERTER SWITCH.

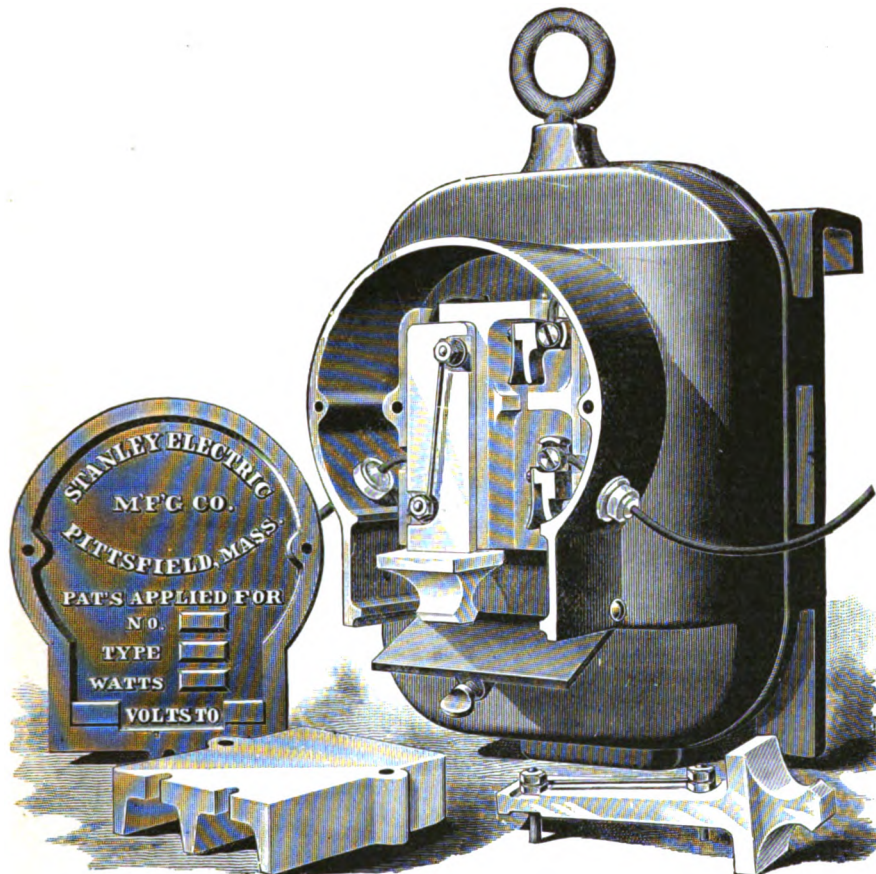


By the use of this Switch, the Converter can be completely cut off from the primary circuit, thereby avoiding all possibility of danger while working on the Converter or on secondary circuit. The mechanism is incased in an iron box, with glass front.

No. 806.	20 Amperes	.....	each, \$ 6.65
" 807.	40 "	.....	" 8.00
" 808.	80 "	.....	" 10.00

# THE STANLEY TRANSFORMER.

Patents Applied For.



The Electrical Supply Company, Exclusive Western Agents.

The following sizes made in the above style:

Trade No.	3457	.....	5 light.
"	3458	.....	10 "
"	3458½	.....	15 "
"	3459	.....	20 "
"	3460	.....	30 "
"	3461	.....	40 "
"	3462	.....	80 "
"	3463	.....	100 "
"	3464	.....	150 "
"	3465	.....	200 "

Transformers are wound for 1,000 and 2,000 volts primary, with either 50 or 100 volts secondary.

## THE STANLEY TRANSFORMER—*Continued.*

The Stanley Transformer has been more carefully designed, and is superior, both electrically and mechanically, to any other. *Although necessarily higher in first cost, it is the cheapest in the end on account of the actual saving in coal and lamp bills.*

**It will be found more efficient.** It maintains the "E. M. F." more nearly uniform under variations of load. Its leakage is less than any other. It is the most convenient to handle and use and its arrangement of fuses is far better than the next best. For these reasons, regardless almost of price, it is the cheapest transformer to buy.

**Regulation.** No feature of transformers causes more trouble than variation of the "E. M. F." on the secondaries between full and light load. In the Stanley Transformer this point has been most carefully studied, with the result that it is practically perfect in this respect. The number of lights can be varied at will without a noticeable change in candle power and without abnormal strain on the lamps. The importance of this is sometimes underestimated. Where the excess of pressure on the secondary is even so small as 3 volts, the lamps will be strained, and a lamp once overrun has materially lost its efficiency and at the same time is considerably shortened in life.

Sometimes we have had occasion to carefully investigate this subject in relation to our sales of Sunbeam Lamps. In the effort to supply a lamp of high efficiency, and one having a reasonable length of life, we have found it necessary to consider the style of transformer used, and where we find transformers in use having poor regulation, we are unable to furnish lamps of such high efficiency, nor are we able to guarantee our lamps for so long a life.

**Leakage.** Current used for which the station receives no pay is simply money wasted. The leakage current is absolutely a constant factor whenever transformers are in a live circuit.

*A saving of so little as one-half an ampere primary current, the equivalent of ten 16 candle power lamps, in the leakage on an entire system, though seemingly small, amounts, in a station running 24 hours per day, to 72,000 lamp hours per year; or at 1 per cent. per lamp hour, \$720.*

The loss by leakage is greatest where many small transformers are used. Our design enables us to bring the leakage on small sizes far below what has been heretofore obtained.

**Safety Devices.** The arrangement of fuses in the Stanley Transformer is exceptionally clever. The secondary fuse is done away with entirely, as it is only an element of trouble, and because every secondary is fused where it enters the building. To replace a fuse requires the use of neither screw-driver nor pliers, and is absolutely safe. The fuse box is entirely of porcelain. The plugs of all sizes of transformers are interchangeable and each fuse is in a separate apartment, doing away with the trouble, so common in other transformers, of the blowing of the fuse on the other pole of the line when one fuse blows.

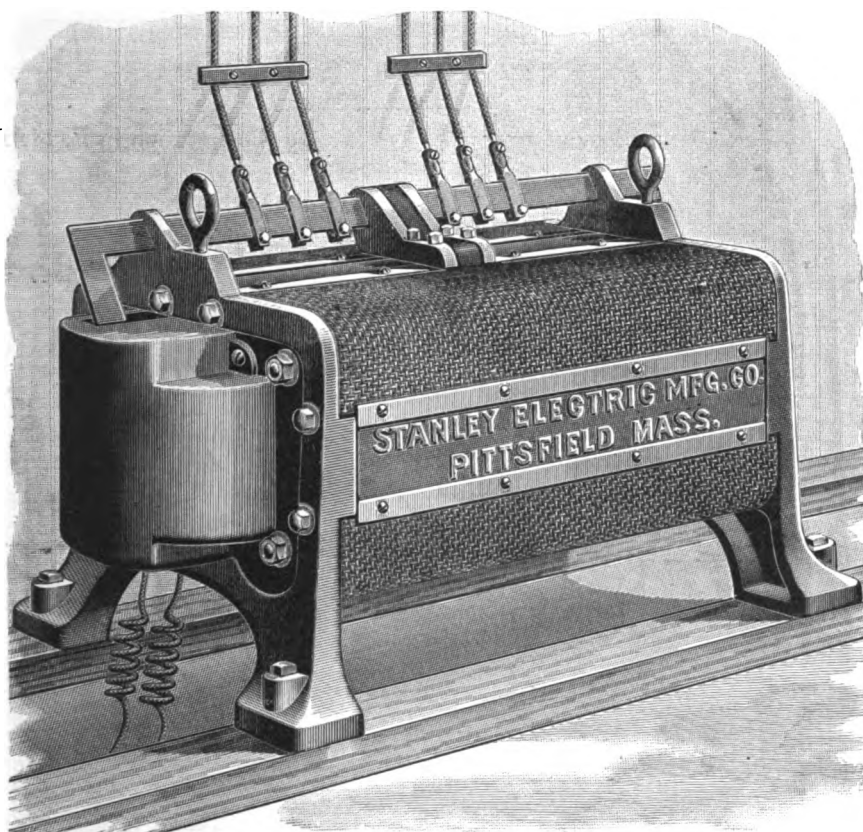
**Convenience.** We especially call the attention of *station superintendents* to the ease with which the transformer can be put in place. It is only necessary to hoist it up by the eye-bolt and hook over the cross-arm or timber on the side of the building. The ends of the supporting hook are sharpened so that they sink into the wood. The transformer then supports its own weight, and can be easily and safely secured. Transformers with any other means of hanging can be furnished when desired. The relatively small weight of the transformer is a strong point in its favor in this connection. In the smaller sizes, where weight is of little consequence for convenience in handling, the Stanley Transformer is as light as any on the market. In the larger sizes, where weight is a most important factor, the design enables them to be made much lighter than others. The smaller size is not at the expense of the general result, but of actual advantage to it.

# THE STANLEY TRANSFORMER

*Continued.*

**LARGE TRANSFORMERS TO BE PLACED UNDER COVER.**

**Patents Applied For.**



The following sizes made in the above style:

Trade No. 3465A	200 light
“ “ 3467	300 “
“ “ 3470	500 “

Transformers are wound for 1,000 and 2,000 volts primary, with either 50 or 100 volts secondary.

## THE STANLEY TRANSFORMER

*Continued.*

The Stanley Company was the first to make a thoroughly successful transformer of even as large a capacity as 100 16 C. P. lamps. Owing to the limits prescribed by weight, and to the necessity for providing some rapid manner of dissipating the heat generated where so much energy is confined in so small a space, the large transformers are designed to be located under cover, and, both electrically and mechanically, are very nearly perfect. They are compact, shapely, and more efficient than any transformer ever before made. On full load they have an efficiency of over 96 per cent., and the variation in E. M. F. on the secondary, between no load and full load, is extremely slight. Each transformer is provided with a set of Buss Bars, and three sets of connectors, to which the main secondary wires are brought and easily connected.

They are made regularly in sizes of 200, 300, and 500 16 C. P. lights each, and we can ship them in three to four weeks from receipt of order. If larger ones are wanted, we will make them to order of any desired size and voltage.

### ADVANTAGES OF LARGE TRANSFORMERS.

The almost universal practice in the past has been the use of a large number of small transformers, the rule being a separate transformer for each place lighted; and consequently, where a large number of lights has been placed in one building, several transformers have had to be used, either connected in multiple or to independent circuits. Both plans are subject to serious objections, and the replacing of several small transformers with one large one will be found to possess a great many advantages. The use of small transformers will always result in stations having in place a greater capacity in lights of transformers than they have lights wired for, as the number of lights in a place will generally not exactly correspond with the capacity of any one of the standard sizes of transformers. Thus the plant will not be run at the most economical point, viz.: when all transformers are fully loaded. For instance, take a block where a number of stores are using lights with, say, a maximum of 230 lights in use at any one time. These lights are supplied by, say, six or eight transformers, with a total capacity of at least 230 lights, and probably considerably more. Now, one good transformer of 200 lights capacity would supply them all, as the whole number would not be burning but for a few hours together, and a proper transformer would handle that over load with ease.

The gain for the large transformer then would be as follows:

First cost of 230 lights in small sizes.....	\$460.00
First cost of 200-lighter, say, \$312.50, 20%.....	250.00
Gain for 200-lighter.....	\$210.00
Cost of installing, say, seven small transformers.....	\$35.00
Cost of installing one 200-lighter.....	15.00
Gain for 200-lighter.....	\$20.00
Total gain for 200-lighter in first cost.....	\$230.00
Leakage Current on seven small transformers.....	5 Amperes.
Leakage Current on one 200-lighter.....	2 Amperes.
Gain for 200-light transformer.....	60% in waste power.

Then there is a decided gain in efficiency, not only because the large transformer can be made more efficient, but also because it is running for a greater percentage of time at a more efficient point than the aggregate of the smaller ones.

The other advantages are many: such as simplicity from having fewer things to look after; fewer connections to the mains; less wire showing on the streets, as the large transformer should be put indoors in a centrally located vault or cellar, and one connection made at the most convenient and unobtrusive place with the mains; longer life from the transformer, as it is not exposed to the elements; fewer unsightly transformers on poles or buildings; ease of inspecting transformers and possibility of keeping them so that no accidents need happen, and various other things which will suggest themselves to any practical man giving the subject careful thought.

There are disadvantages, of course, the principal one being the necessity of longer secondary wiring; but this can be largely overcome by using 100-Volt secondaries instead of 50-Volt, thus reducing the wire to one-quarter of what would be required with 50-Volt secondaries under the same conditions.

We by no means advocate the use of large, to the total exclusion of small, transformers, but believe that by a proper combination of both the best results can be obtained.

*Use large ones in the business centers—the heaviest lighting districts—and small ones for outside extensions.*

*If already entirely equipped in the business centers, don't buy small transformers at a large expense per light for outside extensions, but displace a lot of smaller ones in the business center with one or more large ones, at a comparatively small expense per light, and use the ones so displaced for outside extensions, thus increasing the plant at less cost.*

## THE STANLEY TRANSFORMER

*Continued.*

### SPECIAL TRANSFORMERS.

It often occurs that a lighting company has an opportunity to light some neighboring town or towns distant several miles from the station, which would bring in a profitable revenue if the places could be reached with a small drop on the line at a reasonable cost.

For such work, large, high-potential transformers are particularly valuable. In case of a town five miles distant, where 500 lights, for instance, are wanted, one transformer can be placed in the station, *raising the pressure to, say, 3,000 volts* (more or less, as the case may be), and another one be properly located in the town, reducing again to 1,000 volts, and from this the lights be distributed about the town as usual.

The weight of copper in the main line connecting the transformers with 3,000 volts need only be one-ninth of what would be necessary with 1,000 volts with a given percentage of drop, and the first cost would be small considering that another central station has practically been established. Or we can furnish a transformer to raise the voltage to 2,000, carry the current on wire one-fourth the size of what would be necessary with 1,000 volts, and at the end of the line transform the voltage from 2,000 to 50 or 100 volts, thus using but one extra transformer to do the work.

Many towns too small to warrant a separate plant of their own could be lighted in this way, and thus secure the benefits of the light and at the same time materially increase the earning capacity of a station at a very small comparative first cost for plant.

It also often happens that there is some public institution, hotel, or manufacturing establishment at a considerable distance from the station, which requires a large number of lights, but which can not be served at a reasonable cost because of the large outlay necessary to carry the current to it, and in such cases special transformers can be used to great advantage.

Again, good water-powers are often available, but at so great a distance as to make it unadvisable to attempt to carry the current directly from a dynamo, because of the very high voltage which would be necessary in order to reduce the first cost to within commercial limits. Here large special transformers again come in and make perfectly easy and profitable an enterprise, which, without them, could not be considered.

Work of this kind is not experimental, as several special transformers have been made for just such uses, and have proved satisfactory.

We are prepared to furnish for special uses transformers of any desired capacity and voltage, and guarantee the results, and unless what is furnished comes up to our representations in every respect, it need not be accepted.

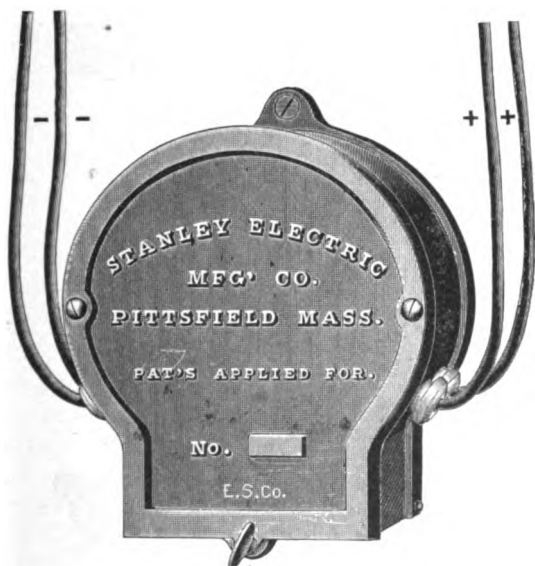
## THE STANLEY TRANSFORMER

*Continued.*

								Prices.
Trade No.	3457.	5	light, with closed case	.....	.....	.....	.....	\$ 25.00
"	"	3458.	10	"	"	"	"	31.25
"	"	3458½.	15	"	"	"	"	37.50
"	"	3459.	20	"	"	"	"	50.00
"	"	3460.	30	"	"	"	"	75.00
"	"	3461.	40	"	"	"	"	100.00
"	"	3462.	80	"	"	"	"	175.00
"	"	3463.	100	"	"	"	"	187.50
"	"	3464.	150	"	"	"	"	262.50
"	"	3465.	200	"	"	"	"	312.50
"	"	3465A.	200	"	with open case	.....	.....	312.50
"	"	3467.	300	"	"	"	"	431.25
"	"	3470.	500	"	"	"	"	687.50

Prices for Special Transformers will be furnished upon application.

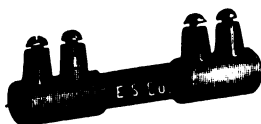
## THE STANLEY PRIMARY FUSE BOX.



This Fuse Box for branch primary lines is similar in design to the fuse box which is placed on every Stanley Converter, and contains all the features which have contributed to make this converter so deservedly popular. Porcelain is used entirely for the insulating parts, and the finish and fittings of the box proper is very much superior to the generality of such devices. Station managers who use this box, will have the satisfaction of knowing that they have fuses which can be expected to act at the proper time, without the tormenting uncertainty caused by the deteriorating effects of time and weather on boxes of inferior construction. The Fuse Box is suitable for use on primary circuits carrying current up to fifteen amperes (300 lights on 1,000 volts or 600 lights on 2,000 volts).

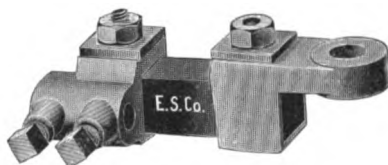
No. 3476.....each, \$6.25

## PRESSURE WIRE FUSE HOLDER.



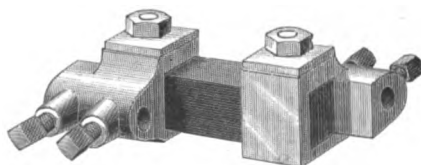
No. 2942 ..... each, \$0.60

## FUSE HOLDER.



No. 2943 ..... each, \$1.90

## FUSE HOLDER.

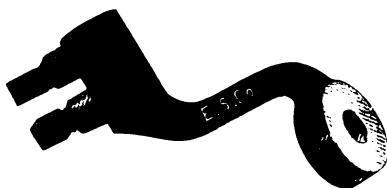


No. 3957. For  $\frac{1}{4}$  inch wire ..... each, \$1.90  
 " 3958. "  $\frac{3}{8}$  " " ..... " 1.90

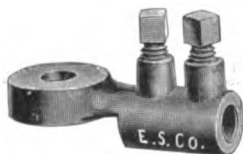
## MAIN AND FEEDER TERMINALS FOR POLE WORK.



No. 2945 .....each, \$0.70



No. 2946 .....each, \$0.97



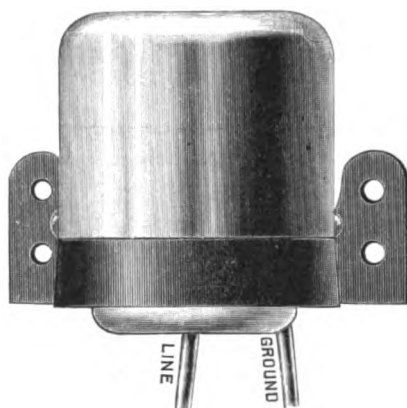
No. 2947 .....each, \$0.77



No. 2949. Bolt, Nut, and Washers for above, according to  
length and composition.....\$0.50 to \$0.79

## WIRT LIGHTNING ARRESTER.

Patented.



**For use on any circuit. Can be placed in any location, and will take repeated discharges without requiring resetting or any other attention.**

We were the first to point out that the proper place to protect a line from lightning is *on the line*. The instructions which we sent out with the first Wirt Lightning Arresters, largely drawn from theory, have been abundantly approved by practice, and it is now generally recognized that to give efficient protection from lightning, discharge points of *proper construction* must be placed at frequent intervals on the line. There is no Arrester made for this purpose at all comparable to the Wirt, particularly on account of its ability to withstand a heavy discharge without injury, and its capacity to take repeated discharges without short circuiting or requiring any subsequent attention.

No.	2592.	To	400 volts	.....	each, \$	7.50
"	2593.	"	600 "	.....	"	8.50
"	2593½.	"	1,000 "	.....	"	10.00
"	2594.	"	1,500 "	.....	"	11.50
"	2595.	"	2,500 "	.....	"	15.00

In ordering always give the tension of current used.

# THE WIRT INCANDESCENT STREET FIXTURE.

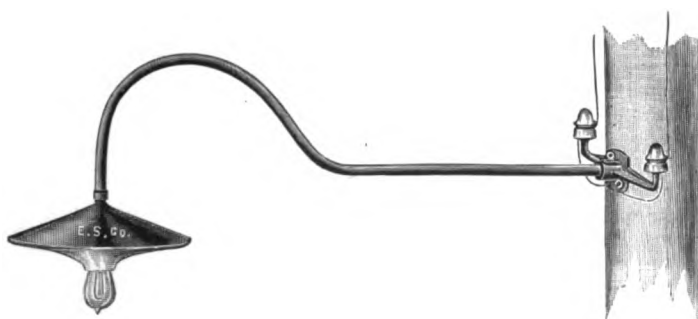
Patent Applied For.



Low Tension Pattern.

The majority of the street fixtures which have been sold up to the present time have been badly designed, poorly built, and generally outrageous, as regards appearance. The Wirt Street Fixture will be found to avoid all these faults, as every detail has received the most careful consideration, both as regards appearance and construction. This pattern is intended for low tension work only, and for that purpose will be found thoroughly reliable and satisfactory. The hood and reflector are made of solid stamped sheet iron, no tin whatever being used. The cast-iron foot is shaped to fit either on a pole or on a flat wall.

No. 3639.	Complete.....	\$4.00
" 3639H.	Hood only.....	each, 3.00
" 3639G.	Goose-Neck Bracket.....	" 1.00
" 3639B.	Base.....	" .25



High Tension Pattern.

This fixture combines the general features of the preceding, with the addition of an insulator between the cast-iron foot and the gas pipe. This permits entering the wires at the base, avoiding the unsightly appearance where wires are run down from the pole to the hood. At the same time, the insulation is superior to what can be obtained by the old method.

No. 3640.	Complete.....	\$6.00
-----------	---------------	--------

## WOOD ARC LAMPS.

**For Direct Incandescent Current Circuits.**



**With Globe in Position.**

In response to a strong demand for an Arc Lamp to run on incandescent circuits, which shall be perfect in construction and less troublesome in operation than lamps which, in spite of many defects, have established the popularity of this system, we offer the Wood Arc Lamp. It is the result of careful study and experiment, and we have full confidence that it will result in increasing the already large number of Arc Lamps in use on low tension circuits. This lamp will burn two in series on direct current circuits of from 90 to 125 volts. The mechanism is extremely simple and the feed is positive, regular, and capable of accurate adjustment for currents between  $6\frac{1}{2}$  and 10 amperes as desired. For indoor use, especially where current is paid for by the meter, the ability to obtain a steady light with smaller current will result in decided economy.

The globe is arranged to be lowered for trimming without the necessity of removing it entirely from the lamp. This feature is extremely convenient and saves many broken globes.

Where single lamps are desired, we will furnish a special resistance, which takes the place of one lamp and enables the single lamp to be regulated to a somewhat smaller current than is the case where lamps are burned in pairs.



**With Globe Lowered for Trimming.**

No. 2812.	One Lamp complete, including Globe .....	\$50.00
No. 2813.	“ “ “ “ and German Silver	
	Resistance .....	55.00

## WARD ARC LAMPS.

Furnished for either Direct or Alternating Current Circuits.

These Lamps are wound to use 8 amperes, when burning 2 in series across 110 volts. They can be run 2 in series on any constant, potential, direct current of from 100 to 125 volts.

No. 2806 for Direct Current Circuits.

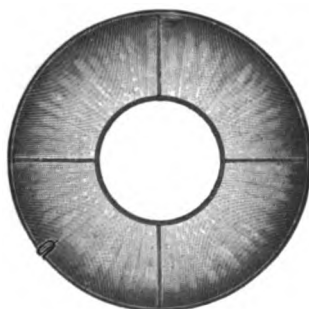
" 2808 for Alternating Current Circuits.

No. 2806. One Lamp complete, including Globe, \$50.00

" 2808. One Lamp complete, including Globe  
and German Silver Resistance..... 55.00



## ARC GLOBE PROTECTOR.



Consists of a mica disc, bound with copper. It protects arc globes from heated pieces of carbon and melted copper. The economy it effects in the saving of globes will pay for its cost in a short time, and in addition, a lamp trimmer can do a third more work than without it. The Protector is placed in the bottom of arc globes, and is sufficiently concave in form to catch all small particles of heated carbon or copper and to direct them to the ash-pan, and by this means the globe is kept clear and free from dirt at all times. Its cost is so slight, and its advantages so great, that no plant, however small, can afford to be without it.

No. 3653. Size 8 inch diameter.....each, \$0.60

## ARC LAMP STREET HOODS.



No. 3643 ..... each, \$4.50

When ordering, give the name of lamp that the Hood is to be used on.



Within the Hood is a stem that prevents it from dropping down upon the wires and short circuiting them. The hollow stem projecting three inches above the top of the Hood, effectually prevents rain or moisture from reaching the top of the lamp. Strong, compact, and neat.

No. 3645. For use on Single-Carbon Lamps.....each, \$1.75  
 “ 3646. “ Double “ “ ..... “ 2.00

## ARC LAMP SPARK ARRESTER.



Underwriters' rules in certain places and common sense at all times demand that where arc lights are placed in proximity to anything inflammable, the arc shall be protected by a proper guard to prevent sparks from passing. The guard which we offer is thoroughly well made and is neatly designed. The wire netting used is of a very fine mesh, which will absolutely prevent the passage of the smallest possible sparks, at the same time cutting off but little of the light rays. These are so made as to be easily applied by anyone, and as easily removed where access is required to the lamp. When ordering, state the make of lamp on which the guard is to be used, and also give the top and bottom diameters and the height required. It is not sufficient in many cases to specify the make of lamp, as changes are so frequently made in the dimensions or style, lamps of the same manufacture often differing considerably from each other when made at different times.



No. 3644. Height, 12 in.; diameter at bottom, 10 in.; diameter at top,  $6\frac{3}{4}$  in. ....each, \$4.00

The above is a standard size, and if any other size is desired, it should be so stated.



## STATION EQUIPMENT

### MATERIAL.

WE call particular attention to our line of Station Switches, which has been increased and much improved since we issued our last general catalogue.

The most important addition to our goods in this department is the Wirt Indicators, which for accuracy, constancy, and general durability, surpass anything in this line before offered by us or others. Especially in incandescent stations the value of these Indicators should be appreciated. They are already in use in some of the largest stations in the country, and where once introduced invariably replace other Indicators.

## SHIELD BRAND MOISTURE-PROOF INSULATION.



### STRANDED CONDUCTORS.

Trade No.	Number of Wires.	Size of Wires.	Equivalent in Carrying Capacity.	Approximate Weight per 1,000 Feet.	Approximate Weight per Mile.	Price per Pound.
181	49	14	0000 B. & S.	753 lbs.	8,975 lbs.	\$0.50
182	41	14	000 "	587 "	3,099 "	.50
183	42	15	00 "	465 "	2,455 "	.50
191	39	16	0 "	365 "	1,927 "	.50
194	49	21	4 "	153 "	808 "	.60
176	7	14	6 "	115 "	607 "	.50
186	21	19	6 "	118 "	623 "	.55
196	49	23	6 "	120 "	634 "	.65
198	49	25	8 "	74 "	391 "	.65
170	28	25	10 "	82 "	169 "	.65

Larger Sizes to Order.

## SHIELD BRAND HARD-DRAWN COPPER WIRE.

### Trade No. 48.

No. 10 B. & S., per pound	.....	\$0.48
" 12 " " "	.....	.50
" 14 " " "	.....	.52
" 16 " " "	.....	.54

## SHIELD BRAND PRESSURE WIRE.

### FOR USE IN INCANDESCENT WORK.

### Trade No. 49

Extra B. B. Galvanized Iron Wire covered with Shield Brand Insulation.

No. 10 W. & M. Gauge (No. 7½ B. & S.), per pound	.....	\$0.22
" 12 " " ( " 10 " ) " "	.....	.28
" 14 " " ( " 12 " ) " "	.....	.37

For full list of Shield Brand Insulation, see pages 6 to 9.



## STANDARD INSULATION.



Solid Conductors—Taped.

H. 150.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.
	B. & S.				B. & S.		
		32ds.	Cents.			32ds.	Cents.
T 184	18	4	2½	T 412	4	12	15½
T 166	16	6	2¾	T 313	3	13	18
T 146	14	6	3½	T 214	2	14	23½
T 127	12	7	4½	T 114	1	14	31½
T 108	10	8	6½	T 015	0	15	41
T 810	8	10	8½	T 00	00	21	55
T 610	6	10	11½	T 000	000	22	63
T 510	5	10	13½	T 0000	0000	23	80

## STANDARD INSULATION.



Solid Conductors—Braided.

H. 151.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.
	B. & S.				B. & S.		
		32ds.	Cents.			32ds.	Cents.
B 184	18	4	2¾	B 412	4	12	16
B 166	16	6	3	B 313	3	13	18½
B 146	14	6	3½	B 214	2	14	24½
B 127	12	7	5	B 114	1	14	32½
B 108	10	8	6½	B 015	0	15	43
B 810	8	10	8½	B 00	00	21	57
B 610	6	10	12	B 000	000	22	65
B 510	5	10	14	B 0000	0000	23	85

We carry in stock all sizes colored, and Nos. 12, 14, and 16 white.  
For full list of Habirshaw Insulation, see pages 12 to 27.

## STANDARD INSULATION.



## Stranded Conductors—Braided.

H. 184.

Trade No.	Gauge.	Strands.	(M)	Approx. Outside Diameter.	Price per Foot.
	B. & S.	Size of Wire.	Circular Mils.	32ds.	Cents.
S. B. 718	8	7-18 B.W.G.	16,807	12	10½
S. B. 716	6	7-16 "	29,575	14½	17½
S. B. 715	5	7-15 "	36,328	14½	19½
S. B. 714	4	7-14 "	48,223	15½	24½
S. B. 711	3	7-11 B.&S.	57,638	16½	29½
S. B. 1917	2	19-17 B.W.G.	63,916	17	32½
S. B. 1916	1	19-16 "	80,275	18½	36
S. B. 1915	0	19-15 "	101,000	19½	47½
S. B. 1914	00	19-14 "	130,891	21½	60
S. B. 1911	000	19-11 B.&S.	158,446	22½	68
S. B. 1912	0000	19-12 B.W.G.	225,739	23½	88

## AMAZITE BRAND.



## Black Core—Braided.

Gauge B. & S.	Price per 1,000 Feet.	Gauge B. & S.	Price per 1,000 Feet.
18	\$ 20.00	4	\$116.75
16	21.25	8	146.00
14	25.50	2	168.00
12	39.50	1	218.00
10	48.50	0	340.00
8	57.50	00	468.00
6	79.00	000	547.00
5	108.25	0000	700.00

## SWITCH BOARD CABLES.



## Very Flexible.

H. 189.

Trade No.	Gauge No.	(M)	Price per Foot.	Trade No.	Gauge No.	(M)	Price per Foot.
		Circular Mils.	Cents.			Circular Mils.	Cents.
H 300	8 B. & S.	16500	17	H 304	3 B. & S.	52634	30½
H 301	6 "	26250	19				
H 302	5 "	33102	20				
H 303	4 "	41742	24	H 308	Special Dynamo Cord, 61-24	29524	30½

For full list of Habirshaw Insulation see pages 12 to 27.

## COPPER BARS.

FOR CENTRAL STATION USE.



## ROUND. Trade No. 32.

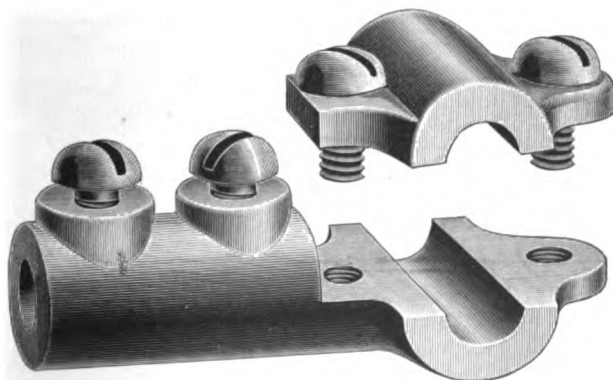
Size.....	$\frac{1}{8}$ in.	$\frac{3}{8}$ in.	$\frac{7}{8}$ in.	$\frac{1}{2}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	$\frac{7}{8}$ in.
Weight per foot....	.297 lb.	.425 lb.	.579 lb.	.756 lb.	.957 lb.	1.182 lb.	1.702 lb.
Price per pound....	\$0.45	.45	.45	.45	.45	.45	.45

## FLAT. Trade No. 33.

Size.....	$\frac{1}{2} \times 1\frac{1}{2}$ in.	$\frac{3}{4} \times 1\frac{1}{2}$ in.	$\frac{3}{4} \times 2$ in.	$\frac{1}{2} \times 2$ in.	$\frac{1}{2} \times 2\frac{1}{2}$ in.	$\frac{1}{2} \times 2\frac{1}{2}$ in.
Weight per foot....	1.215 lb.	2.188 lb.	2.917 lb.	3.890 lb.	4.376 lb.	4.862 lb.
Price per pound....	\$0.45	.45	.45	.45	.45	.45

These are standard sizes. Orders promptly filled by shipment direct from factory.

## BUS BAR CONNECTOR.



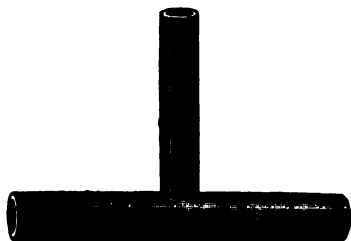
No. 473.	To $\frac{3}{8}$ inch wire.....	each, \$ .85
" 474.	" $\frac{1}{2}$ " " .....	" 1.50

## WIRT CONNECTORS.

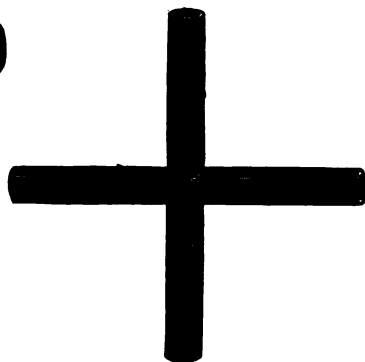
To be Soldered.



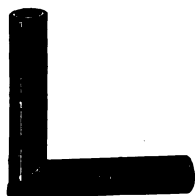
No. 464.



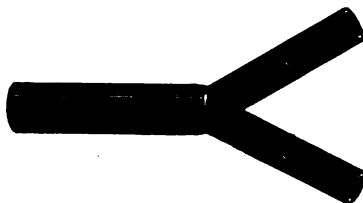
No. 465.



No. 466.



No. 467.



No. 468.

These Connectors are well made, of electrical copper, the cross section of the metal being equal to the cross section of hole, giving ample conductivity.

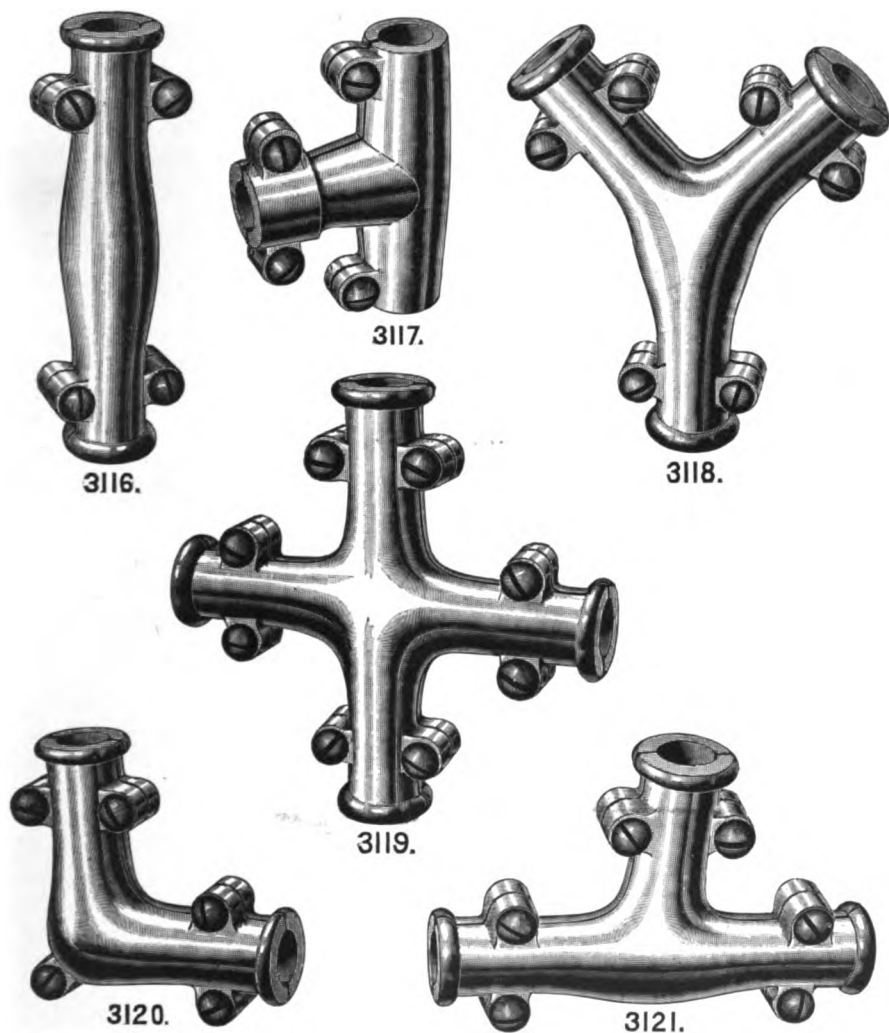
They will effect a large saving of energy over Connectors with set screws, and are the best means of securing a perfect and symmetrical joint.

We think no station man, or superintendent, who takes pride in the work under his care can fail to appreciate the utility and convenience of these Connectors. They can be used in either bare rod or insulated wiring.

We carry a complete assortment in stock, for quick delivery, and will make any size or angle to order, on short notice.

No. 464.	Straight,	$\frac{1}{2}$ inch	.....	each, \$	.35
" 464.	"	$\frac{3}{8}$	"	"	.30
" 465.	" T "	$\frac{1}{2}$	"	"	1.05
" 465.	"	$\frac{3}{8}$	"	"	.85
" 466.	Cross,	$\frac{1}{2}$	"	"	1.60
" 466.	"	$\frac{3}{8}$	"	"	1.40
" 467.	Elbow,	$\frac{1}{2}$	"	"	.85
" 467.	"	$\frac{3}{8}$	"	"	.65
" 468.	" Y "	$\frac{1}{2}$	"	"	1.50
" 468.	"	$\frac{3}{8}$	"	"	1.40

## CLAMP CONNECTORS.

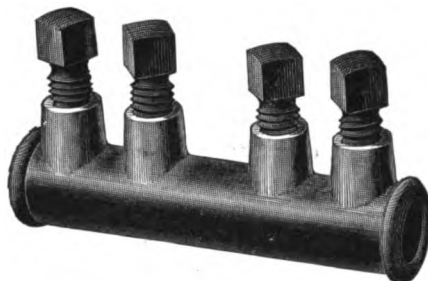


No. 3116.	Straight Connector for $\frac{1}{8}$ inch rod.	.....	\$1.10
" 3117.	" T "	" " " .....	1.20
" 3118.	" Y "	" " " .....	1.15
" 3119.	Cross	" " " .....	2.20
" 3120.	Elbow	" " " .....	1.25
" 3121.	" T "	" " " .....	1.45

## CONNECTORS

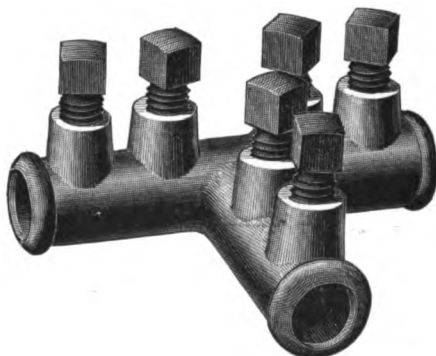
*Continued.*

## STRAIGHT CONNECTOR.



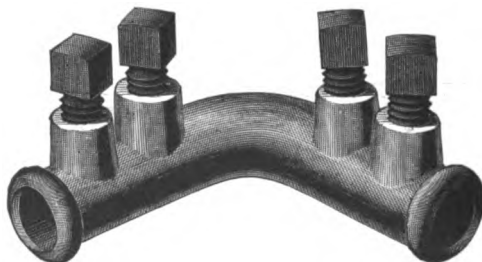
No. 451. Size for  $\frac{1}{2}$  inch wire ..... each, \$0.70  
 " 452. " "  $\frac{5}{8}$  " " ..... " .85

## "T" CONNECTOR.



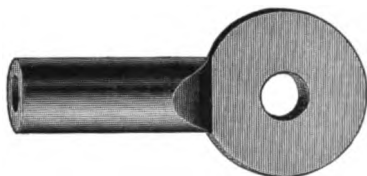
No. 455. Size for  $\frac{1}{2}$  inch wire ..... each, \$ .95  
 " 456. " "  $\frac{5}{8}$  " " ..... " 1.15

## ELBOW CONNECTOR.



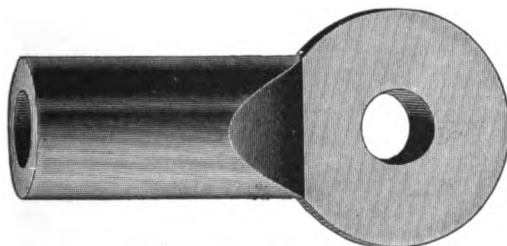
No. 459. Size for  $\frac{1}{2}$  inch wire ..... each, \$0.85  
 " 460. " "  $\frac{5}{8}$  " " ..... " .95

## WIRE TERMINALS.



No. 4159.	B. & S. Gauge,	0	.....	per 100, \$18.35
" 4160.	"	"	1	" 15.00
" 4161.	"	"	2	" 13.35
" 4162.	"	"	3	" 12.50
" 4163.	"	"	4	" 11.70
" 4164.	"	"	6	" 10.00
" 4165.	"	"	8	" 8.35
" 4166.	"	"	10	" 7.50
" 4167.	"	"	12	" 6.70

## HEAVY TERMINALS.



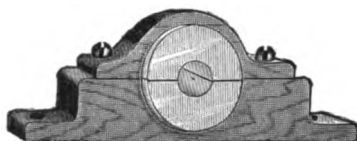
No. 4168.	For	$\frac{3}{16}$	inch rod,	$\frac{5}{16}$	inch screw	.....	each, \$0.18
" 4169.	"	$\frac{1}{4}$	"	$\frac{3}{8}$	"	"	.30
" 4170.	"	$\frac{3}{8}$	"	$\frac{1}{2}$	"	"	.57
" 4171.	"	$\frac{5}{8}$	"	$\frac{1}{2}$	"	"	.80

## FEEDER LUGS.



No.	For rods up to	inch,	$\frac{5}{16}$	inch cap screw	.....	each, \$	Plain.	Polished.
No. 4113.	For rods up to	$\frac{3}{8}$	inch,	$\frac{5}{16}$	inch cap screw	.....	\$ .60	\$ .80
" 4114.	"	$\frac{1}{2}$	"	$\frac{5}{16}$	"	.....	.80	1.05
" 4115.	"	$\frac{3}{4}$	"	$\frac{3}{8}$	"	.....	1.00	1.25

## FLETCHER'S INSULATED WOOD RISERS.



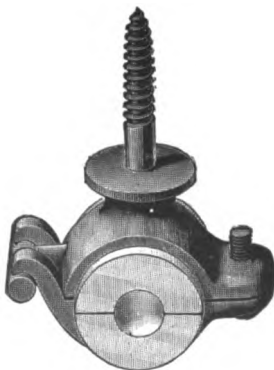
Patented.

The Fletcher Insulated Wood Risers are used in fitting up electric light and power stations with wire or copper rods. Please caliper your wire and order by catalogue numbers, to insure a perfect fit.

No. 2397.	$\frac{3}{8}$ inch	porcelain insulation	.....	each, \$0.25
" 2398.	$\frac{1}{2}$ "	glass insulation	.....	" .30
" 2399.	$\frac{5}{8}$ "	" " "	.....	" .30
" 2400.	$\frac{3}{4}$ "	" " "	.....	" .40

## FLETCHER'S GEM WIRE HOLDERS.

**Porcelain Insulation.**



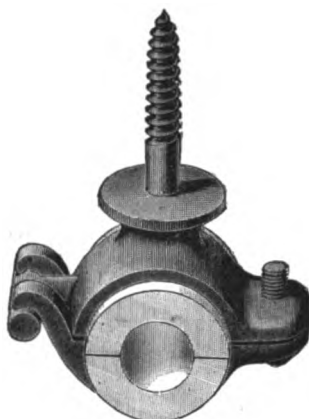
Patented.

No. 482.	$\frac{1}{4}$ inch	opening	.....	per 100, \$10.00
" 483.	$\frac{3}{8}$ "	" " "	.....	" 15.00

## FLETCHER'S GEM WIRE HOLDERS.

*Continued.*

Opalescent Glass Insulation.



Patented.

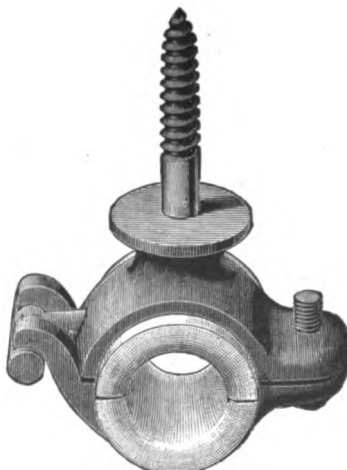
No. 487.	$\frac{1}{8}$ inch opening	.....	per 100, \$20.00
" 488.	" "	.....	" 20.00
" 489.	" "	.....	" 25.00
" 490.	" "	.....	" 25.00

## FLETCHER'S "JUMBO" WIRE HOLDERS.

Opalescent Glass Insulation.

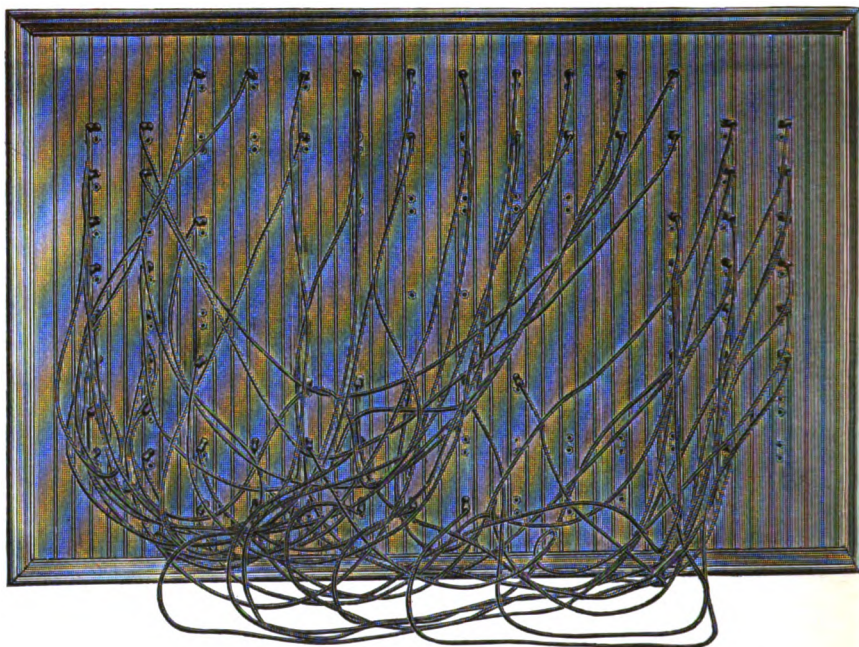
The Fletcher "Jumbo" Wire Holders are especially desirable where heavy insulated cables are used. They are sufficiently strong to support the heaviest cable made, and add materially to the beauty of the construction.

No. 491.	1 inch opening, per 100, \$25.00
" 493.	$1\frac{1}{4}$ " " " 50.00
" 494.	$1\frac{1}{2}$ " " " 60.00



Patented.

## SAFETY ELECTRIC LIGHT SWITCH BOARD.



The board here shown is intended for 20 dynamos and 25 circuits. All permanent connections are made from the back, no metal appearing on the front. The dynamo connections are made at the sides—positive at the right, negative at the left. Line connections are made at top and bottom—positive at bottom, negative at top. With the exception of ammeter connectors, the center of board is free from wires and connections, leaving man in charge room to work. The ammeter may be located on wall or any other suitable place, and connected with any circuit by means of entrances shown in center of board.

Each connection is provided with two entrances, so that dynamo may be changed from one circuit to another, or any other change made between circuits and dynamos without breaking the circuits. Connections are rubbing contact and guaranteed in every respect. The flexible cables are well insulated, and each one is long enough to do any required work.

Extra cables are provided for temporary work and all entrances and plugs are of the same size, so that no time need be lost or confusion occasioned by hunting for special cables.

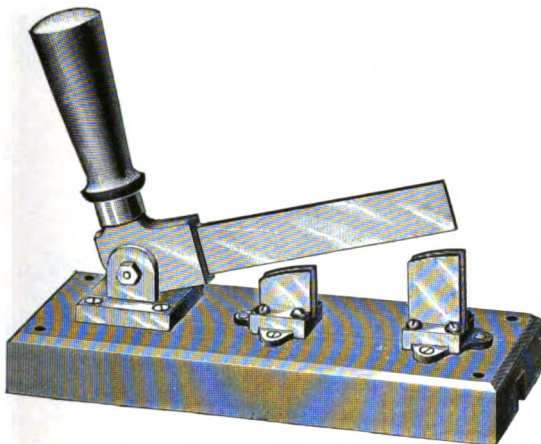
The board itself is built of tongued and grooved lumber well seasoned, oak and ash being alternately worked together, sides of boards tapering so that any slight shrinkage which may occur will not be noticeable. Boards are built to order. When writing state the number of dynamos and circuits the board is required for.

Prices for Switch Boards, complete, will be quoted upon receipt of specifications.

No. 1186. Plug only .....	each, \$1.50
“ 1187. Socket “ .....	“ 2.00

## WIRT FEEDER SWITCH.

DOUBLE BREAK.



For pressures up to 500 Volts.

### WOOD BASE.

No. 881 W.	75 Amperes	each, \$10.00
" 882 W.	150 " "	15.00
" 883 W.	300 " "	21.00
" 884 W.	600 " "	24.00
" 885 W.	1000 " "	40.00

### SLATE BASE.

No. 881.	75 Amperes	each, \$12.00
" 882.	150 " "	18.00
" 883.	300 " "	25.00
" 884.	600 " "	28.00
" 885.	1000 " "	48.00

A large margin has been allowed in rating the carrying capacity. The double break makes it the only desirable Switch to use where the Switch must be opened with the current on.

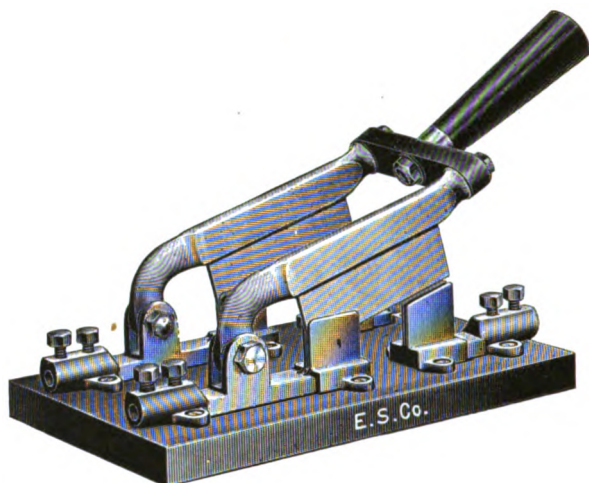
## SMALL FEEDER SWITCH.

WITH FUSE.



No. 803.	50 Amperes, Slate Base	each, \$5.00
" 803 W.	50 " Wood "	4.00

## DOUBLE POLE CENTRAL STATION SWITCH.



### MAHOGANY BASE.

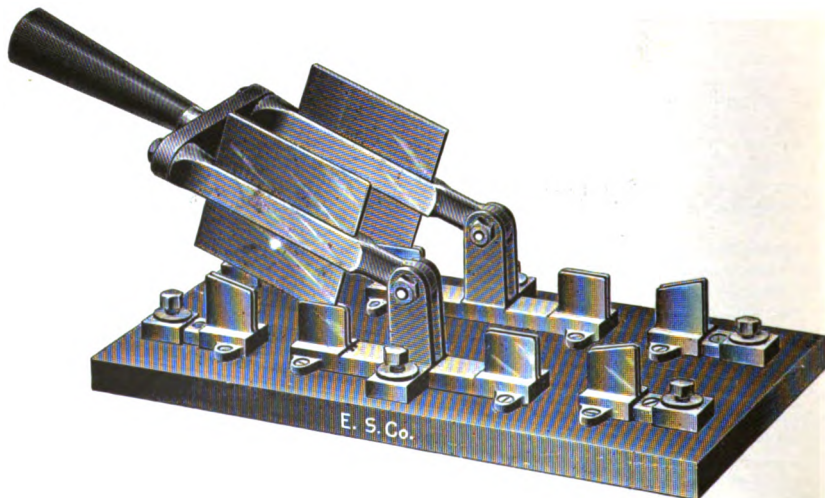
No. 1181W.	100 Amperes, each	-----	\$20.00
" 1183W.	250 " "	-----	30.00
" 1183W.	400 " "	-----	42.00
" 1184W.	600 " "	-----	48.00
" 1185W.	1,000 " "	-----	64.00

### SLATE BASE.

No. 1181.	100 Amperes, each	-----	\$22.00
" 1182.	250 " "	-----	33.00
" 1183.	400 " "	-----	46.00
" 1184.	600 " "	-----	52.00
" 1185.	1,000 " "	-----	70.00

## CIRCUIT CHANGING SWITCH.

### DOUBLE POLE.

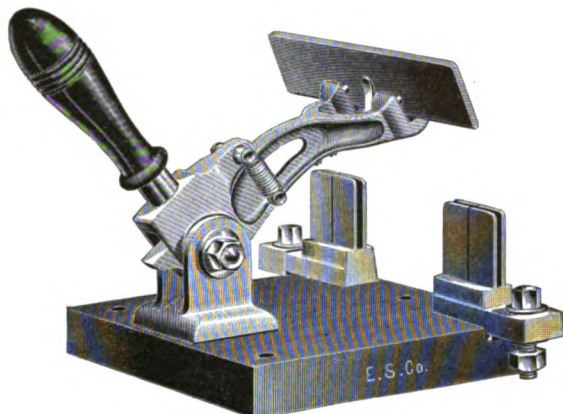


### For Alternating Incandescent Work.

No. 1191.	150 Amperes	.....	each, \$30.00
" 1192.	500 " "	.....	" 68.00

## SPIRAL SPRING LEVER SNAP SWITCH.

PLAIN SLATE BASE, PLAIN FINISH.



Designed for use on high tension circuits, where a quick, sharp break is necessary. Prices are without Safety Fuses.

### SINGLE POLE.

No. 1453.	50 Ampere	each,	\$ 4.50
" 1454.	100	" "	6.50
" 1455.	250	" "	10.00
" 1456.	400	" "	13.00
" 1457.	600	" "	17.00

### DOUBLE POLE.

No. 1463.	50 Ampere	each,	\$ 7.00
" 1464.	100	" "	12.50
" 1465.	250	" "	19.00
" 1466.	400	" "	25.50
" 1467.	600	" "	30.50

## DOUBLE-POLE SNAP SWITCH.

This is a well-designed Snap Switch, giving a double break on both poles at the same time by means of a powerful spring which is compressed by movement of the handle. It is suitable for a variety of purposes, the quick action and four simultaneous breaks making it very desirable for high tension currents.

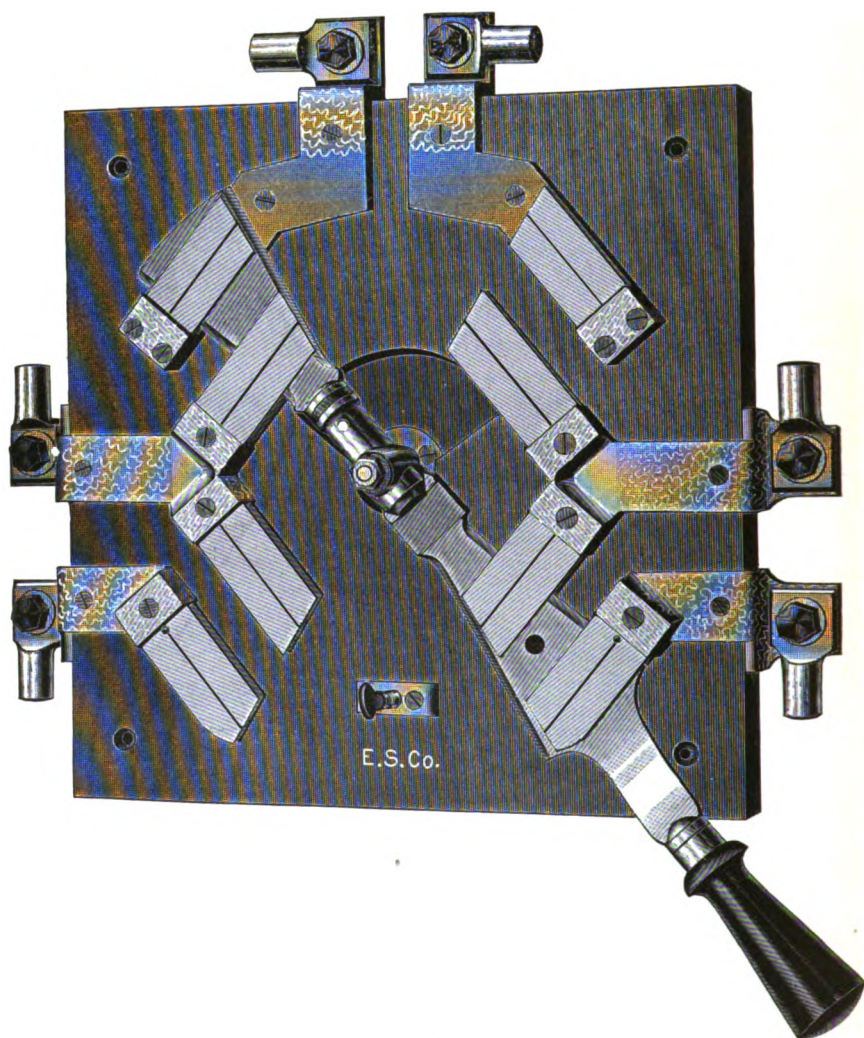


Trade No. 1460. 100 Amperes, Wood base.....each, \$20.00

Furnished on Slate base to order.

# DYNAMO CHANGING SWITCH.

Two Wire System.



No. 1494.	300 Amperes	.....	each, \$48.00
" 1495.	400 "	.....	" 57.00
" 1496.	600 "	.....	" 85.00

## ALTERNATING STATION SWITCHES.

SLATE BASE, SINGLE POLE, SINGLE THROW.



No. 3127.	30 Amperes	.....	each, \$ 7.50
" 3128.	75 "	.....	" 12.50
" 3129.	150 "	.....	" 18.75
" 3130.	300 "	.....	" 31.25
" 3131.	600 "	.....	" 43.75
" 3132.	1,000 "	.....	" 81.25

SINGLE POLE, DOUBLE THROW.

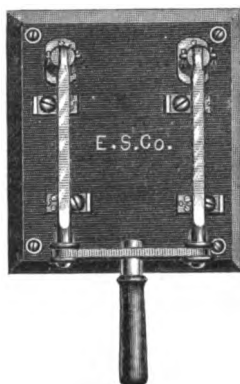


No. 3133.	30 Amperes	.....	each, \$ 10.00
" 3134.	75 "	.....	" 18.75
" 3135.	150 "	.....	" 31.25
" 3136.	300 "	.....	" 50.00
" 3137.	600 "	.....	" 75.00
" 3138.	1,000 "	.....	" 125.00

# ALTERNATING STATION SWITCHES

*Continued.*

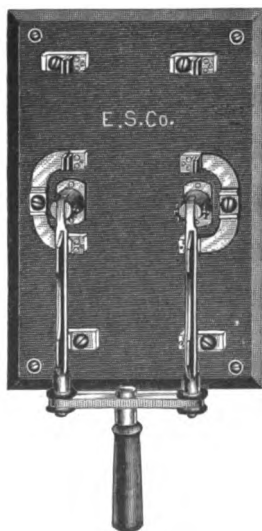
## DOUBLE POLE, SINGLE THROW.



**No. 3139.**

No. 3139.	30 Amperes	.....	each, \$	12.50
" 3140.	75 "	.....	"	25.00
" 3141.	150 "	.....	"	37.50
" 3142.	300 "	.....	"	45.00
" 3143.	600 "	.....	"	87.50
" 3144.	1,000 "	.....	"	125.00

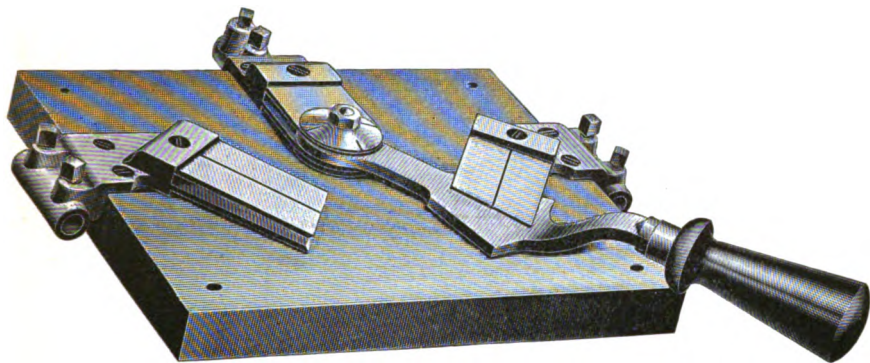
## DOUBLE POLE, DOUBLE THROW.



**No. 3145.**

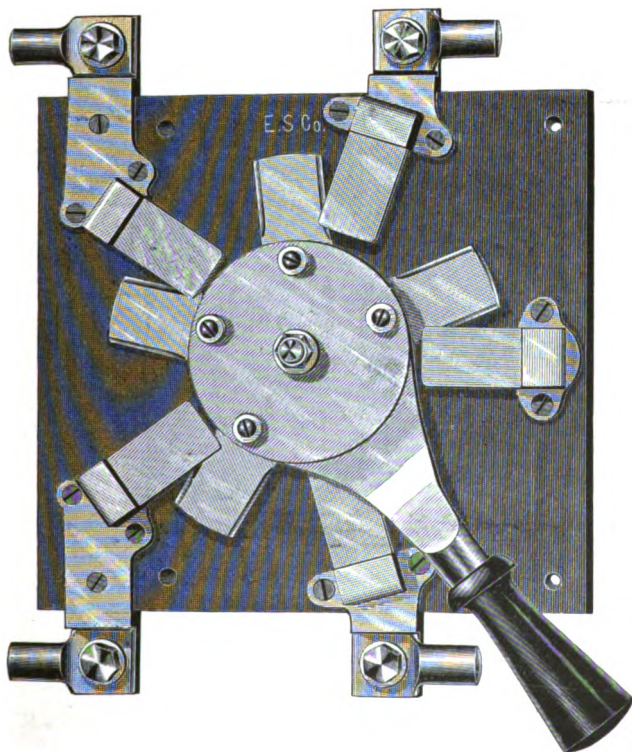
No. 3145.	30 Amperes	.....	each, \$	18.75
" 3146.	75 "	.....	"	31.25
" 3147.	150 "	.....	"	50.00
" 3148.	300 "	.....	"	75.00
" 3149.	600 "	.....	"	125.00
" 3150.	1,000 "	.....	"	187.50

TWO-WAY LEVER SWITCH.



No. 2961. Capacity, 300 Amperes.....each, \$29.50

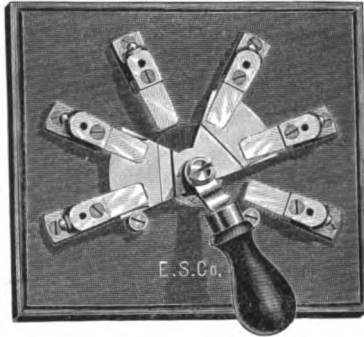
BREAK-DOWN LEVER SWITCH.



No. 2962. Capacity, 300 Amperes.....each, \$37.75  
" 2963. " 400 " ..... " 46.50

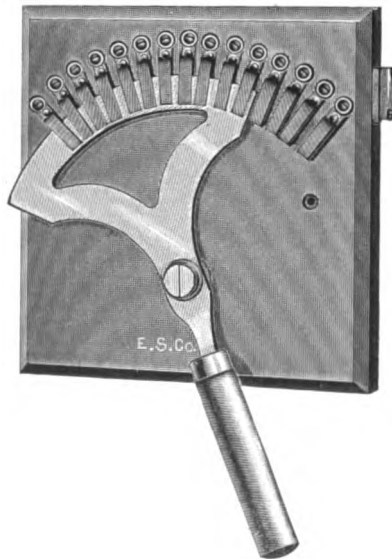
## STORAGE BATTERY CHANGING SWITCH.

Used for Changing from Series to Multiple.



No. 2964. Capacity, 15 Amperes..... each, \$7.70

## MULTIPLE SWITCH.

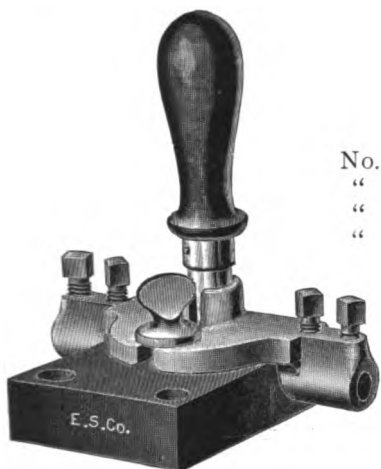


Used for throwing lights in or out in succession, increasing or decreasing.  
It can also be used as a rheostat commutator.

No. 1500. Suitable for 1 to 15 lights..... each, \$8.00

Other sizes to order.

## PLUG SWITCH.



No. 2957.	Slate Base, $\frac{5}{8}$ in. Plug	each, \$3.00
" 2957W.	Wood " " " "	2.65
" 2958.	Slate " $\frac{3}{4}$ " " "	3.50
" 2958W.	Wood " $\frac{3}{4}$ " " "	3.15

## FUSE HOLDERS.

Feeder Plug Switch and Fuse Holder.



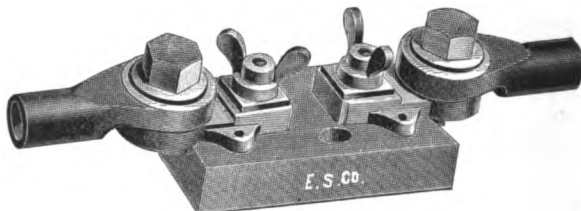
No. 3955.	Slate Base, $\frac{5}{8}$ inch Plug	each, \$5.50
" 3955W.	Wood " $\frac{5}{8}$ " " "	5.00



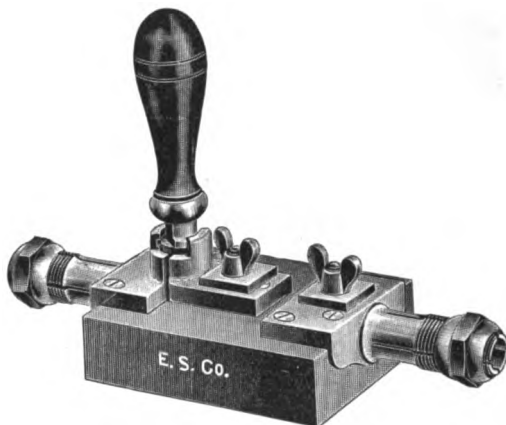
No. 3956.	Slate Base	each, \$2.65
" 3956W.	Wood " "	2.40

## FUSE HOLDERS

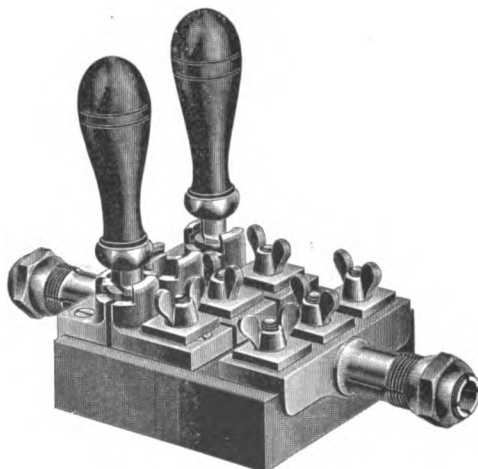
*Continued.*



- No. 2953. Wood base, capacity 400 Amperes, or less.....each, \$3.40  
 " 2953. Slate " " 400 " " ..... " 3.65



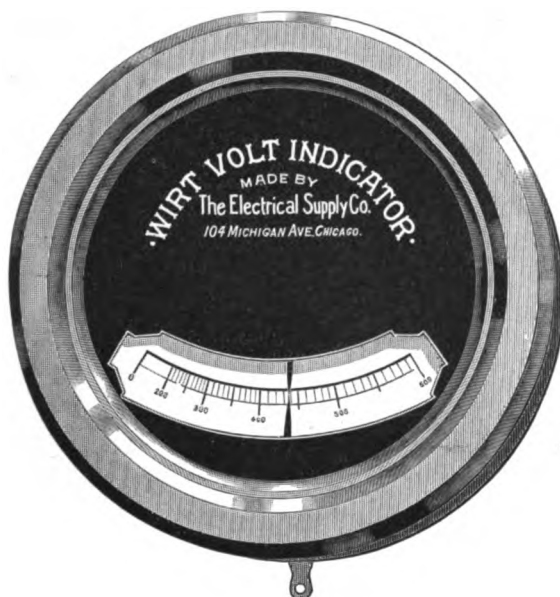
- No. 2952. Fuse Holder and Single Lock Plug Switch for  $\frac{1}{8}$  in. Rod,  
 Price, including one Plug, without Fuse Strips, on Slate  
 base .....each, \$8.75



- No. 2951. Fuse Holder and Triple Lock Plug Switch for  $\frac{1}{8}$  in. Rod,  
 Price, including two Plugs, without Fuse Strips, on  
 Slate base.....each, \$12.50

## WIRT VOLT INDICATORS.

Patented.



### For Stationary Work Only. To be Left in Circuit Continuously.

These Indicators will best be appreciated by those whose wishes have been consulted in the designing of them, viz.: Station electricians and managers. Their principal good points may be summed up as follows:

1. Accuracy.
2. Constancy.
3. Ability to read the scale from a distance without using a telescope, or walking close to the instrument every time a reading is taken.
4. Appearance, which is entirely unaffected by time, dust, or dirt, as the exposed parts are all made of metal, except the glass front.
5. Durability, which is secured by a wise selection of the action used and proper attention to workmanship and choice of materials.

We guarantee these instruments unconditionally as to accuracy and perfect performance and will exchange any instrument proving defective within one year, if returned to us with the seals unbroken.

No. 2496.	Reading up to 60 Volts (for Alternating Currents)	.....each,	\$45.00
" 2497.	" " 120 " (for Direct Currents)	.....	" 45.00
" 2498.	" " 140 " " " "	.....	" 45.00
" 2499.	" " 275 " " " "	.....	" 55.00
" 2500.	" " 600 " " " "	.....	" 60.00

Any other reading made to order. In Volt Indicators we assume the scale will be used mostly for the higher readings, and accordingly arrange the divisions so that those which are most used will be the longest, in order to have the greatest possible deflection for a given variation. This feature will be appreciated by those who have had experience with instruments which require inspection at close range.

## WIRT AMPERE INDICATOR.

Patented.



**For Stationary Work Only. To be Left in Circuit Continuously.**

This is similar in electrical design to the Volt Indicator described on the preceding page. The principle is one which lends itself very perfectly to the production of instruments of large ampere capacity, and these are distinguished for low resistance and the ease with which they can be accurately calibrated.

No. 2501.	10 Amperes	.....	each, \$30.00
" 2502.	15 "	.....	" 30.00
" 2503.	30 "	.....	" 30.00
" 2504.	50 "	.....	" 30.00
" 2505.	100 "	.....	" 35.00
" 2506.	150 "	.....	" 40.00
" 2507.	200 "	.....	" 45.00
" 2508.	300 "	.....	" 65.00
" 2509.	400 "	.....	" 70.00
" 2510.	500 "	.....	" 75.00
" 2511.	1,000 "	.....	" 90.00

## B.-W. AMPERE INDICATOR.

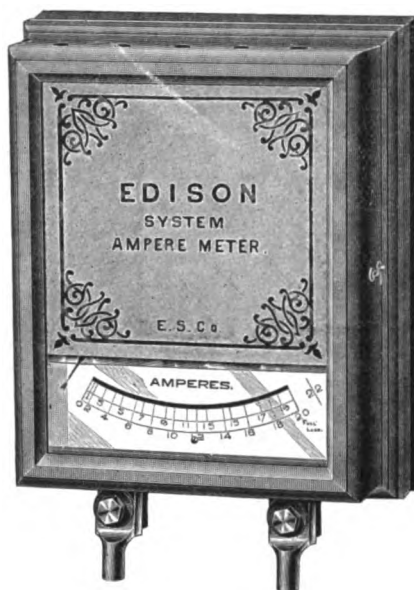
Patented.



This instrument contains the same action as the Wirt Indicator, but is put up in a cheaper case, and is the nearest approach we care to make to a certain class of cheap instruments which have appeared on the market and acquired popularity with contractors doing work under conditions which prevent the use of strictly high-class apparatus. The cases are of solid metal, dust-proof and moisture-proof, and are neatly finished. The scale is a very open one and can easily be read at a considerable distance. These instruments are not affected by outside influence, or by transportation or handling, and they can be relied upon to remain constant and to stand wear.

No. 2679.	0- 15	.....	each, \$20.00
" 2680.	0- 25	.....	" 20.00
" 2681.	0- 50	.....	" 20.00
" 2682.	0-100	.....	" 22.50

## EDISON AMPERE METERS.

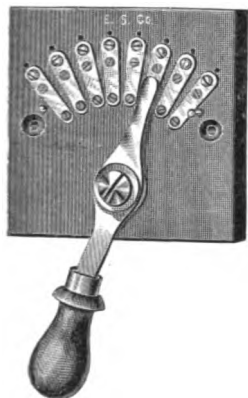
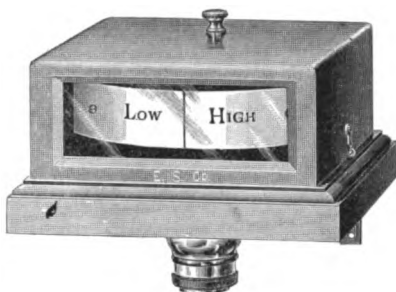


No. 2748.	4 Amperes	.....	each, \$15.13
" 2749.	6	" .....	" 19.00
" 2750.	12	" .....	" 38.00
" 2751.	24	" .....	" 75.00
" 2752.	48	" .....	" 50.00
" 2753.	68	" .....	" 17.25
" 2754.	94	" .....	" 18.00
" 2755.	120	" .....	" 18.75
" 2756.	160	" .....	" 20.00
" 2757.	200	" .....	" 21.25
" 2758.	240	" .....	" 22.50
" 2759.	360	" .....	" 26.50
" 2760.	480	" .....	" 30.00
" 2761.	715	" .....	" 40.00

## BALANCE GALVANOMETER.

Dynamo Galvanometer for indicating when the Volts of Dynamos are equal to the Volts on the Bus.

No. 2558 ..... each, \$12.00



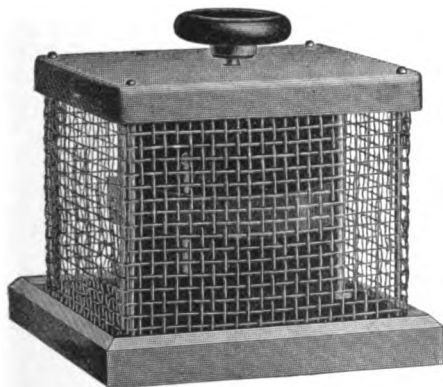
## GALVANOMETER SWITCH.

For Use with Dynamo Galvanometer.

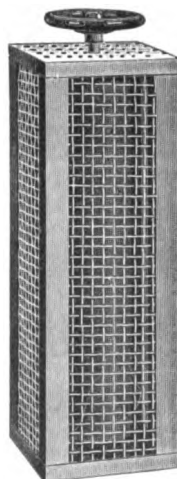
No. 2559 ..... each, \$4.75

## THE WIRT RHEOSTAT.

Patented.



**Dynamo Regulator.**

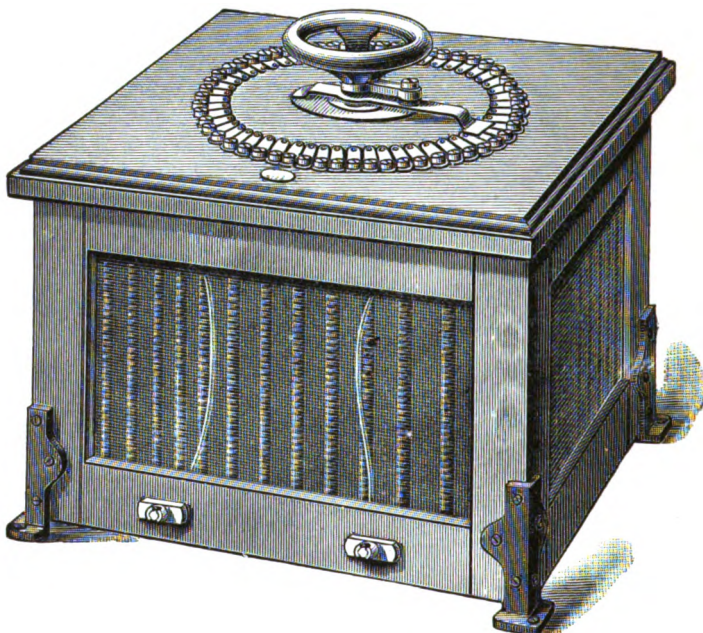


**Stage Regulator.**

These are suitable for use in dynamo regulation, motor regulation, lamp regulating, and for a variety of purposes where a variable resistance is required. They have many advantages over all other rheostats, some of which are the following: Compactness, Fireproof construction, Simplicity, Reliability, ability to carry a momentary heavy overload without injury.

**Special Prices will be Quoted on Application.**

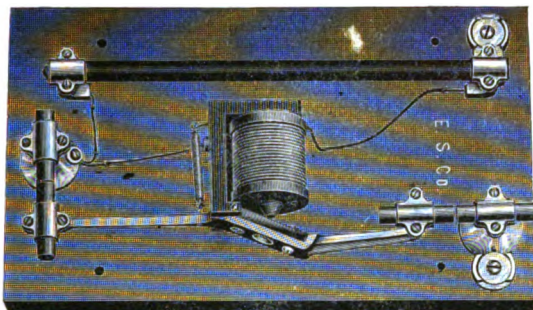
## DYNAMO RESISTANCE BOX.



No. 811.

No. 4028.	Hand Field	Regulator for $1\frac{1}{2}$ K. W. Dynamo	.....	\$30.50
" 4029.	"	"	3 " " .....	31.25
" 4030.	"	"	6 " " .....	32.50
" 4031.	"	"	9 " " .....	33.75
" 4032.	"	"	12 " " .....	35.00
" 4033.	"	"	15 " " .....	37.50
" 4034.	"	"	20 " " .....	40.00
" 4035.	"	"	25 " " .....	42.50
" 4036.	"	"	30 " " .....	45.00
" 4037.	"	"	45 " " .....	50.00
" 4038.	"	"	60 " " .....	55.00
" 4039.	"	"	100 " " .....	75.00
" 4040.	"	"	175 " " .....	115.00

## EDISON LIGHTNING ARRESTER.



This represents a very well known type of Arrester, designed to break the ground circuit in case of the passage of the dynamo current. The action is entirely automatic, no attention being required.

No. 2599.....each, \$10.00

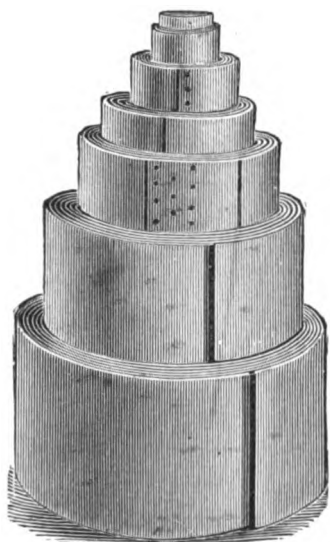
## UNDERWOOD COTTON LEATHER DYNAMO BELTING.

This belting possesses the following points of merit :

- 1st. It will not stretch.
  - 2d. It runs perfectly straight on the pulleys and is practically noiseless.
  - 3d. It is perfectly balanced, all parts being of uniform texture and equal weight.
  - 4th. It will not slip.
- Tensile strength is 1,750 pounds per inch of width.

### PRICE LIST.

Width. Inches.	Price per Running Foot.	Width. Inches.	Price per Running Foot.	Width. Inches.	Price per Running Foot.
2	\$ .46	9	\$2.30	24	\$ 7.08
2½	.52	10	2.58	26	7.84
2¾	.60	11	2.84	28	8.60
2¾	.66	12	3.10	30	9.28
3	.72	13	3.36	32	10.00
3½	.86	14	3.64	34	10.70
4	1.00	15	3.96	36	11.40
4½	1.12	16	4.28	38	12.10
5	1.26	17	4.62	40	12.80
5½	1.40	18	4.98	42	13.50
6	1.52	19	5.32	44	14.20
7	1.80	20	5.68	46	14.90
8	2.04	22	6.40	48	15.60



Trade No. 3523.

## MUNSON'S DYNAMO LEATHER BELTING.

When ordering, state width of belt, work required, diameter of pulleys, distance between centers of shafting, speed and H. P. transmitted. If net length of belt is given, by measuring around both pulleys, please state if you desire us to add prepared ends to place belt on pulleys endless, or simply butt ends, if to be laced. For "Dynos" we always add prepared ends (unless otherwise instructed), and charge for lap. It is desirable to have dynamo belts made endless at the factory

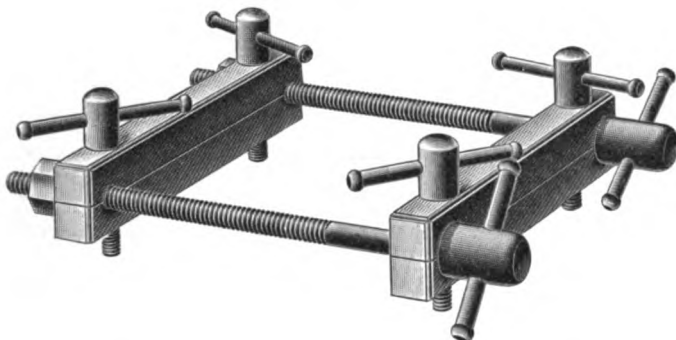
### PRICE PER RUNNING FOOT.

Width.	Price.	Width.	Price.	Width.	Price.	Width.	Price.
1 Inch.	\$ .20	4½ Ins.	\$1.12	13 Ins.	\$3.36	24 Ins.	\$7.08
1¼ " "	.26	5 " "	1.26	14 " "	3.64	26 " "	7.84
1½ " "	.34	5½ " "	1.40	15 " "	3.96	28 " "	8.60
1¾ " "	.40	6 " "	1.52	16 " "	4.28	30 " "	9.28
2 " "	.46	6½ " "	1.66	17 " "	4.62	32 " "	10.00
2¼ " "	.52	7 " "	1.80	18 " "	4.98	34 " "	10.70
2½ " "	.60	8 " "	2.04	19 " "	5.32	36 " "	11.40
2¾ " "	.66	9 " "	2.30	20 " "	5.68	40 " "	12.80
3 " "	.72	10 " "	2.58	21 " "	6.04	44 " "	14.20
3½ " "	.86	11 " "	2.84	22 " "	6.40	48 " "	15.60
4 " "	1.00	12 " "	3.10	23 " "	6.74	52 " "	17.00

The stretch, other than elasticity, is removed ; no rivets, and perfect evenness in weight, making a noiseless and perfect motion, which is essential for a steady light.

We have made arrangements which enable us to furnish, on short notice, endless or other belts, any thickness and any width, up to sixty inches, of the finest oak tan leather, with stretch entirely removed. All belts are guaranteed. For alternating work a special belt will be furnished. *When a belt is wanted in a hurry, telegraph the order to us.*

## WOODEN BELT CLAMPS.



These are very convenient for splicing belts, as they hold the belt firm and can be adjusted to give the belt any desired tension while making splice. As these clamps are made entirely of wood, they will not rust or give trouble.

No. 3534 ..... each, \$7.00

## MUNSON'S WELDING BELT CEMENT.

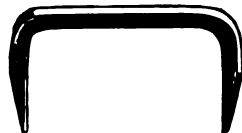


By using the Welding Belt Cement an ordinary belt can be made endless. It can be used quickly and if properly applied, will be more serviceable than any other form of belt joint. Please follow directions carefully.

No. 3537 ..... per pound, \$1.25

## EUREKA BELT FASTENER.

These Fasteners are made of the best steel, especially annealed so that the points will not break in clinching. They will stand more strain than lacing. Can be used on any diameter of pulley, and on leather, rubber, or canvas belting.



No. 3540.	$\frac{3}{4}$ inch spread, light	..... per 1,000,	\$2.50
" 3541.	$\frac{3}{4}$ " " heavy	..... "	2.85
" 3542.	1 " " light	..... "	3.20
" 3543.	1 " " heavy	..... "	3.60

## ELLIS COMBINATION OIL FILTER.



This Filter is made of heavy galvanized iron, copper bound, brass faucets and pet cocks. No glass gauges or jackets to get broken or become leaky. The filtering material can be replaced for 15 or 20 cents. It does not need close attention.

This Filter will cleanse thoroughly any kind of lubricating oil, which can be used over and over again without impairing its lubricating qualities.

We have sold so many of these Filters in the past years without a single case of dissatisfaction, that we consider they are now too well known to need extended comment. We will continue to send them as before to responsible parties on thirty days' trial, as we have found that a trial is all that is necessary to convince the most skeptical of their economical value.

No. 3505.	Filter and Receiver, complete,	5-gallon capacity	....	each,	\$25.00
" 3510.	"	"	10	"	30.00
" 3511.	"	"	15	"	35.00
" 3512.	"	"	20	"	45.00

## CROWN OIL FILTER.

Patented.

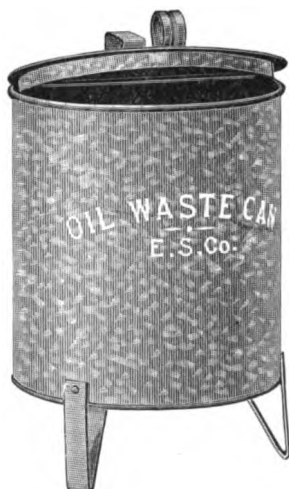


This Filter possesses all the advantages of the most perfect of the older forms with the added advantage of great simplicity, which will make it acceptable both to those who have had experience with some of the more complicated devices of this class and to those who have been waiting for a Filter which should be perfectly simple in operation and easy to understand. For continuous operation, perfect performance, and durability, we are certain that this Filter will never be improved upon.

To get the best results, soak the filtering pads from 20 to 30 minutes in perfectly clean oil before setting up.

No. 3497.	Filters	3	gallons	in	24	hours	.....	each,	\$20.00
" 3498.	"	6	"	"	"	"	.....	"	30.00
" 3499.	"	10	"	"	"	"	.....	"	40.00

## OIL WASTE CAN.



This can conforms to the requirements of the Fire Underwriters' Association.

No. 3519. 4 gallons ..... each, \$1.50

## AZTEC OIL TANK.

Iron Pan, Large Force Pump.



No. 3507.	30 gal.,	1½ in. pump,	19½ in. diam.,	38 in. high	..... each,	\$10.50
" 3508.	60 "	1½ "	25½ "	40½ in. "	..... "	12.00
" 3509.	Oil Pump only				..... "	2.00

## SURE-FEED OILERS.

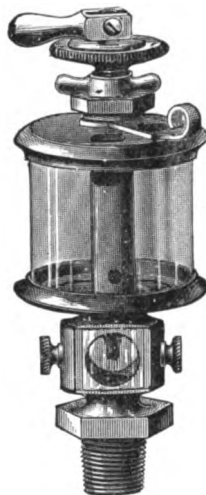
## SIGNAL SIGHT FEED.

Fig. 1.



Shows oil dropping while machinery runs.

Fig. 2.



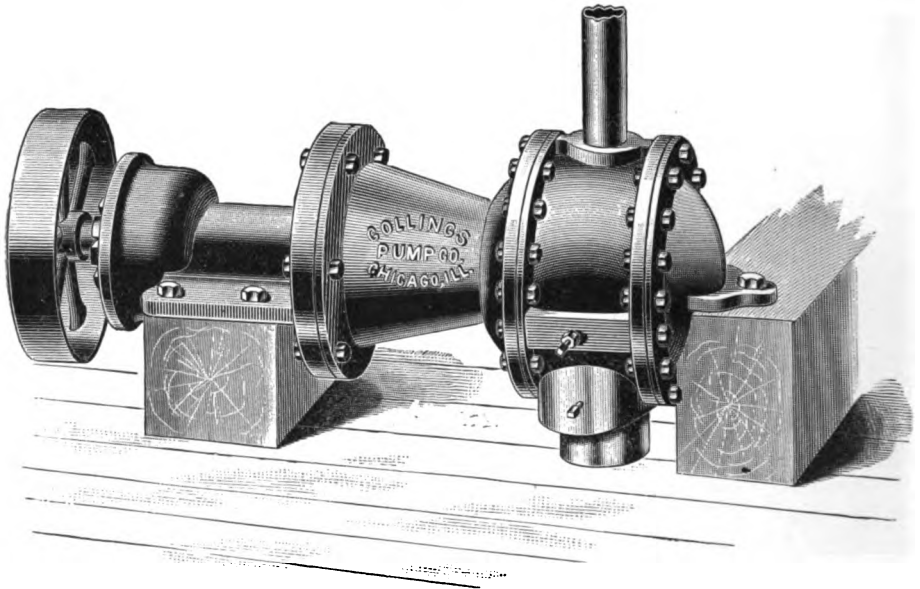
Shows flow of oil stopped while machinery stops.

The flow of oil may be instantly stopped or started *without changing the set of feed*. The quantity is regulated by thumb-screw. The sight chamber in this oiler is fitted with glass window panes, and may be removed for inspection, cleaning or repairing, without stopping the oil feed, while the dynamo is running.

No.	Diam. of Glass. Inches.	Height of Glass.	Capacity.	Size of Shank, Pipe Thread. Inches.	Signal Sight Feed Oiler. Price.
3560	1 $\frac{1}{4}$	1 $\frac{1}{8}$	$\frac{1}{2}$ oz.	$\frac{1}{4}$	\$3.00
3561	1 $\frac{1}{2}$	1 $\frac{3}{8}$	$\frac{3}{8}$ "	$\frac{1}{4}$	3.25
3561 $\frac{1}{2}$	1 $\frac{3}{4}$	1 $\frac{5}{8}$	1 "	$\frac{3}{8}$	3.50
3562	2	1 $\frac{7}{8}$	2 "	$\frac{3}{8}$	3.75
3563	2 $\frac{1}{4}$	2 $\frac{1}{8}$	3 "	$\frac{3}{8}$	4.25
3564	2 $\frac{3}{4}$	2 $\frac{1}{4}$	4 "	$\frac{1}{2}$	5.25
3565	3	2 $\frac{3}{4}$	8 "	$\frac{1}{2}$	7.25
3566	3 $\frac{1}{2}$	4	1 pt.	$\frac{1}{2}$	9.25

## THE GOLLINGS PUMP.

Patented.



This Pump is valveless, without packing, non-reciprocating, non-rotary, except as to driving shaft; takes liquids by air displacement and forces them to any height, limited only by strength of material and power applied. In the use of power it is economical, for the friction is reduced to a minimum. The action upon the liquid pumped is continuous, and therefore does not require air chamber, nor to be of duplex form, to deliver a steady stream. In the matter of space required, it is economical. It can be operated by any power, and is especially adapted for electric motors. Within the pump is but *one working piece*, which is actuated by the driving shaft and pulley as shown in cut, and *takes* and *discharges* liquids in a steady, unbroken flow. It also takes up its wear and will maintain, when in action, a water-tight joint.

Prices and full particulars furnished upon application.

## HOUSE EQUIPMENT

### MATERIAL.

IN no department of our catalogue will be found so many changes and so many improved goods, since the issue of our old catalogue, as in this one. Our Engineering Department has been devoted almost exclusively during the past year to goods in this line, which are mainly for use in connection with incandescent lighting. We will not attempt to enumerate all of the new and improved devices that we have added to this department, but will call particular attention to the Sunbeam Incandescent Lamps, which are now used in so large a number of stations; also the Wirt Electricity Meter, which we are just bringing out, and which is the result of a great amount of study and experimenting, and which will be found more accurate and simple in its mechanism than any of the meters offered by others.

# SHIELD BRAND MOISTURE-PROOF INSULATION.



## REGULAR INSULATION.



Trade No. 44.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,950 lbs.	748 lbs.	\$0.45	5	705 lbs.	134 lbs.	\$0.44
000	3,285 "	622 "	.45	6	600 "	114 "	.44
00	2,555 "	484 "	.44	8	445 "	84 "	.45
0	2,090 "	396 "	.44	10	255 "	49 "	.48
1	1,620 "	307 "	.44	12	170 "	32 "	.50
2	1,280 "	242 "	.44	14	110 "	21 "	.52
3	1,015 "	192 "	.44	16	70 "	13 "	.54
4	860 "	163 "	.44	18	60 "	11 "	.58

## SPECIAL INSULATION.



Trade No. 45.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	4,142 lbs.	784 lbs.	\$0.47	3	1,073 lbs.	203 lbs.	\$0.46
000	3,487 "	660 "	.47	4	924 "	175 "	.46
00	2,699 "	511 "	.46	5	764 "	144 "	.46
0	2,225 "	421 "	.46	6	660 "	125 "	.46
1	1,715 "	324 "	.46	8	505 "	95 "	.47
2	1,353 "	256 "	.46				

For full list of Shield Brand Insulation, see pages 6 to 9.

## SHIELD BRAND MOISTURE-PROOF INSULATION.



### STRANDED CONDUCTORS.

Trade No.	Number of Wires.	Size of Wires.	Equivalent in Carrying Capacity.	Approximate Weight per 1,000 Feet.	Approximate Weight per Mile.	Price per Pound.
181	49	14	0000 B. & S.	753 lbs.	3,975 lbs.	\$0.50
182	41	14	000 "	587 "	3,099 "	.50
183	42	15	00 "	465 "	2,455 "	.50
191	39	16	0 "	365 "	1,927 "	.50
194	49	21	4 "	153 "	808 "	.60
176	7	14	6 "	115 "	607 "	.50
186	21	19	6 "	118 "	623 "	.55
196	49	23	6 "	120 "	634 "	.65
198	49	25	8 "	74 "	391 "	.65
170	28	25	10 "	32 "	169 "	.65

Larger Sizes to Order.

## SHIELD BRAND HARD-DRAWN COPPER WIRE.

### Trade No. 48.

No. 10 B. & S., per pound	.....	\$0.48
" 12 " " "	.....	.50
" 14 " " "	.....	.52
" 16 " " "	.....	.54

## SHIELD BRAND PRESSURE WIRE.

### FOR USE IN INCANDESCENT WORK.

### Trade No. 49.

Extra B. B. Galvanized Iron Wire covered with Shield Brand Insulation.

No. 10 W. & M. Gauge (No. 7½ B. & S.), per pound	.....	\$0.22
" 12 " " ( " 10 " ) " "	.....	.28
" 14 " " ( " 12 " ) " "	.....	.37

For full list of Shield Brand Insulation, see pages 6 to 9.

## P. & B. WEATHER-PROOF LINE WIRE.



The P. & B. WEATHER-PROOF INSULATION has been several years on the market, and the test of time has fully verified the claims that we have made for it. This insulation will be found superior to most of those insulations we find in the market under the general name of "Weather-Proof."



Trade No. 41.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	3,739 lbs.	708 lbs.	\$0.42	6	505 lbs.	95 lbs.	\$0.40
000	3,115 "	590 "	.42	7	415 "	78 "	.43
00	2,425 "	459 "	.40	8	344 "	65 "	.43
0	1,895 "	359 "	.40	10	241 "	45 "	.44
1	1,491 "	282 "	.40	12	146 "	27 "	.46
2	1,180 "	223 "	.40	14	100 "	19 "	.48
3	940 "	178 "	.40	16	65 "	12 "	.53
4	758 "	143 "	.40	18	43 "	8 "	.56
5	620 "	117 "	.40				

Our trade-mark (registered) is placed on all tags of "P. & B." Weather-Proof Line Wire. None genuine without it.

## UNDERWRITERS LINE WIRE.

SOLID CONDUCTOR.



Trade No. 39.

Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.	Nos. B. & S. Gauge.	Approximate Weight, Insulated.		Price per Pound.
	Per Mile.	Per 1,000 Feet.			Per Mile.	Per 1,000 Feet.	
0000	8,960 lbs.	750 lbs.	\$0.42	6	575 lbs.	109 lbs.	\$0.40
000	2,957 "	560 "	.42	8	390 "	74 "	.42
00	2,600 "	492 "	.40	9	300 "	57 "	.44
0	1,990 "	376 "	.40	10	285 "	54 "	.44
1	1,600 "	308 "	.40	12	180 "	35 "	.46
2	1,270 "	241 "	.40	14	110 "	21 "	.48
3	1,025 "	195 "	.40	16	74 "	14 "	.52
4	880 "	167 "	.40	18	64 "	12 "	.56
5	720 "	136 "	.40				

## UNDERWRITERS INSULATION.

STRANDED CONDUCTOR.



Trade No.	Number of Wires.	Size of Wires.	Equivalent in Carrying Capacity.	Approximate Weight per 100 Feet.	Price per Pound.
104	7	12	4 B. & S.	18 lbs.	\$0.35
114	21	17	4 "	17 "	.35
107	26	18	4 "	17 "	.36
105	7	18	5 "	15 "	.35
115	21	18	5 "	14 "	.36
109	6	18	10 "	5 "	.36
111	26	24	10 "	5 "	.37



## STANDARD INSULATION.



## Solid Conductors—Taped.

H. 150.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Taped.
	B. & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
T 184	18	4	2½	T 412	4	12	15½
T 166	16	6	2¾	T 313	3	13	18
T 146	14	6	3½	T 214	2	14	23½
T 127	12	7	4½	T 114	1	14	31½
T 108	10	8	6½	T 015	0	15	41
T 810	8	10	8½	T 00	00	21	55
T 610	6	10	11½	T 000	000	22	63
T 510	5	10	13½	T0000	0000	23	80

## STANDARD INSULATION.



## Solid Conductors—Braided.

H. 151.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.
	B. & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
B 184	18	4	2¾	B 412	4	12	16
B 166	16	6	3	B 313	3	13	18½
B 146	14	6	3½	B 214	2	14	24½
B 127	12	7	5	B 114	1	14	32½
B 108	10	8	6½	B 015	0	15	43
B 810	8	10	8½	B 00	00	21	57
B 610	6	10	12	B 000	000	22	65
B 510	5	10	14	B0000	0000	23	85

We carry in stock all sizes colored, and Nos. 12, 14, and 16 white.

For full list of Habirshaw Insulation, see pages 12 to 27.



FLAME-PROOF.



Solid Conductors—Braided.

H. 154.

Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.	Trade No.	Gauge.	Approx. Outside Diameter.	Price per Foot Braided.
	B. & S.	32ds.	Cents.		B. & S.	32ds.	Cents.
F. P. 184	18	4	2½	F. P. 412	4	12	16
F. P. 168	16	6	3	F. P. 318	8	18	18½
F. P. 146	14	6	3½	F. P. 214	2	14	24½
F. P. 127	12	7	5	F. P. 114	1	14	32½
F. P. 108	10	8	6½	F. P. 015	0	15	48
F. P. 810	8	10	8½	F. P. 00	00	21	57
F. P. 610	6	10	12	F. P. 000	000	22	65
F. P. 510	5	10	14	F. P. 0000	0000	23	85

STANDARD INSULATION.



Stranded Conductors—Braided.

H. 154.

Trade No.	Gauge.	Strands.	M Circular Mils.	Approx. Outside Diameter.	Price per Foot.
	B. & S.	Size of Wire.		32ds.	Cents.
S. B. 718	8	7-18 B.W.G.	16,807	12	10½
S. B. 716	6	7-16 "	29,575	14½	17½
S. B. 715	5	7-15 "	36,328	14½	19½
S. B. 714	4	7-14 "	48,223	15½	24½
S. B. 711	3	7-11 B. & S.	57,638	16½	29½
S. B. 1917	2	19-17 B.W.G.	63,916	17	32½
S. B. 1916	1	19-16 "	80,275	18½	36
S. B. 1915	0	19-15 "	101,000	19½	47½
S. B. 1914	00	19-14 "	130,891	21½	60
S. B. 1911	000	19-11 B. & S.	156,446	22½	68
S. B. 1912	0000	19-12 B.W.G.	225,739	23½	88

For full list of Habirshaw Insulation, see pages 12 to 27.



"AMAZITE" BRAND.

Black Core Insulation.



Solid Conductors — Braided.

Gauge B. & S.	Price per 1,000 Feet.	Gauge B. & S.	Price per 1,000 Feet.	Gauge B. & S.	Price per 1,000 Feet.
18	\$20.00	6	\$ 79.00	1	\$218.00
16	21.25	5	108.25	0	340.00
14	25.50	4	116.75	00	468.00
12	39.50	3	146.00	000	547.00
10	48.50	2	168.00	0000	700.00
8	57.75				

## TAPED FIXTURE WIRE.



H. 168.

SINGLE CONDUCTOR.			DOUBLE CONDUCTOR.		
Trade No.	Gauge.	Price per Foot.	Trade No.	Gauge.	Price per Foot.
	B. & S.	Cents.		B. & S.	Cents.
200	18	2 $\frac{5}{8}$	201	18	3 $\frac{1}{2}$
202	16	3	203	16	5 $\frac{1}{4}$
204	14	3 $\frac{3}{4}$	205	14	6 $\frac{1}{2}$

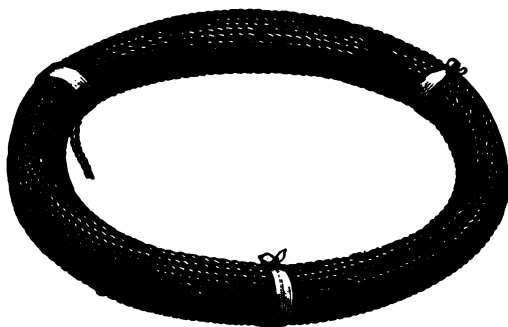
## INCANDESCENT LAMP CORD.

H. 110.

COTTON.				SILK.			
Trade No.	Gauge.	Strand.	Price per Foot.	Trade No.	Gauge.	Strand.	Price per Foot.
	B. & S.		Cents.		B. & S.		Cents.
C 400	22	6-30 B. W. G.	5	S 400	22	6-30 B. W. G.	6
C 401	20	8-30 "	5 $\frac{1}{2}$	S 401	20	8-30 "	7
C 402	18	12-30 "	8	S 402	18	12-30 "	9 $\frac{1}{2}$
C 403	16	19-30 "	11 $\frac{1}{2}$	S 403	16	19-30 "	13 $\frac{1}{2}$
C 404	14	29-30 "	14	S 404	14	29-30 "	16 $\frac{1}{2}$
C 405	12	46-30 "	16 $\frac{1}{2}$	S 405	12	46-30 "	20 $\frac{1}{2}$

For full list of Habirshaw Insulation, see pages 12 to 27.

## INCANDESCENT LAMP CORD.



COTTON COVERED.			SILK COVERED.		
Trade No.	Equivalent to	Price per Yard.	Trade No.	Equivalent to	Price per Yard.
273	12 B. & S.	\$0.35	278	12 B. & S.	\$0.44
274	14 "	.24	279	14 "	.32
275	16 "	.13 $\frac{3}{4}$	280	16 "	.20
276	18 "	.10	281	18 "	.17 $\frac{1}{2}$
277	20 "	.08	282	20 "	.13

Each strand composed of fine wires, insulated with rubber and braided and both conductors twisted together.

Furnished in different colors or combination of colors.

## FIRE-PROOF INCANDESCENT LAMP CORD.

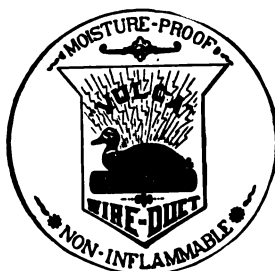


This cord is manufactured by a process which renders it absolutely *fire, water, and moisture proof*.

It will char under extreme heat but *will not conduct flame*. This property renders it very desirable in wiring dry-goods houses, factories, and private dwellings.

COTTON COVERED.			SILK COVERED.		
Trade No.	Equivalent to	Price per Yard.	Trade No.	Equivalent to	Price per Yard.
283	12 B. & S.	\$0.38	289	12 B. & S.	\$0.48
284	14 "	.28	290	14 "	.40
285	16 "	.17	291	16 "	.27
286	18 "	.13	292	18 "	.21
287	20 "	.10	293	20 "	.17

## "VULCA" ELECTRICAL WIRE-DUCTS.



This Tubing is not made of paper, but is entirely fire and water-proof. It is not liable to be broken in construction, and is cheaper to use than some others, on account of the saving in labor. The insulation resistance is superior to any other tubing on the market.

## "VULCA" TUBING.



Trade No.	3267.	$\frac{1}{4}$	inch, inside diameter	.....	per 100 feet,	\$ 2.50
"	3268.	$\frac{3}{8}$	" " "	.....	" "	3.00
"	3269.	$\frac{1}{2}$	" " "	.....	" "	3.75
"	3270.	$\frac{3}{4}$	" " "	.....	" "	4.50
"	3271.	$\frac{7}{8}$	" " "	.....	" "	5.00
"	3272.	1	" " "	.....	" "	6.25
"	3273.	$1\frac{1}{4}$	" " "	.....	" "	10.00

## "VULCA" DUPLEX TUBING.



Trade No.	3276.	$\frac{1}{4}$	inch, inside diameter	.....	per 100 feet,	\$ 8.00
"	3277.	$\frac{3}{8}$	" " "	.....	" "	10.00
"	3278.	$\frac{1}{2}$	" " "	.....	" "	12.00

## ELBOWS FOR "VULCA" TUBING.



Trade No. 3281.	$\frac{1}{4}$ inch, inside diameter, per 100.....	\$ 4.50
" " 3282.	$\frac{3}{8}$ " " " " .....	5.50
" " 3283.	$\frac{1}{2}$ " " " " .....	6.50
" " 3284.	$\frac{5}{8}$ " " " " .....	7.50
" " 3285.	$\frac{3}{4}$ " " " " .....	8.50
" " 3286.	1 " " " " .....	11.50
" " 3287.	$1\frac{1}{4}$ " " " " .....	15.00

## BRASS COUPLINGS FOR "VULCA" TUBING.



Trade No. 3290.	$\frac{1}{4}$ inch, per 100.....	\$2.20
" " 3291.	$\frac{3}{8}$ " " .....	2.45
" " 3292.	$\frac{1}{2}$ " " .....	2.75
" " 3293.	$\frac{5}{8}$ " " .....	3.60
" " 3294.	$\frac{3}{4}$ " " .....	4.00
" " 3295.	1 " " .....	5.00
" " 3296.	$1\frac{1}{4}$ " " .....	6.00

## FLEXITE TUBING.

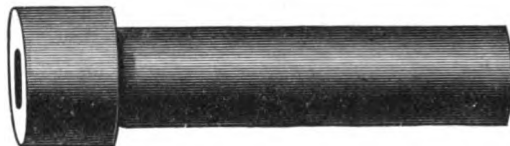
*Flexite*

This is a hard rubber tubing, which can be bent into any shape, and is made in three and twelve foot lengths.

No. 3299.	Per pound.....	\$1.75
-----------	----------------	--------

## HARD RUBBER WINDOW TUBES.

WITH HEADS.



PLAIN.

Trade No.	In. Long.	Outside Diameter.	Inside Diameter.	Price per Hundred.	Trade No.	In. Long.	Outside Diameter.	Inside Diameter.	Price per Hundred.
5	3	$\frac{7}{16}$	$\frac{1}{4}$	\$ 6.00	15	8	$\frac{3}{4}$	$\frac{1}{2}$	\$30.00
7	6	$\frac{1}{8}$	$\frac{1}{4}$	12.00	18	3	$\frac{9}{16}$	$\frac{5}{8}$	7.50
12	4	$\frac{5}{8}$	$\frac{3}{8}$	13.50	19	4	$\frac{3}{4}$	$\frac{1}{2}$	15.00

## HARD RUBBER INSULATING TUBING.



In Lengths of 24 Inches.

Outside Diameter.	Inside Diameter.	Price per Pound.	Outside Diameter.	Inside Diameter.	Price per Pound.
$\frac{1}{2}$ inch.	$\frac{1}{4}$ inch.	\$1.25	$\frac{3}{4}$ inch.	$\frac{1}{2}$ inch.	\$1.00
$\frac{3}{4}$ "	$\frac{5}{8}$ "	1.25	1 "	$\frac{3}{4}$ "	1.00
$\frac{1}{2}$ "	$\frac{3}{8}$ "	1.00	$1\frac{1}{8}$ "	$\frac{7}{8}$ "	1.00
$\frac{3}{8}$ "	$\frac{1}{4}$ "	1.00	$1\frac{1}{4}$ "	1 "	1.00

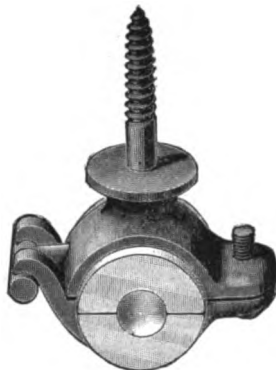
## SOFT RUBBER TUBING.



Size, inside diameter.....inches,	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{3}{8}$	$\frac{1}{2}$
Will cover insulated wire No. B.						
& S.....	20	14	10	6	4	0
Per foot.....	\$0.08	.12	.16	.18	.20	.25

## FLETCHER'S GEM WIRE HOLDERS.

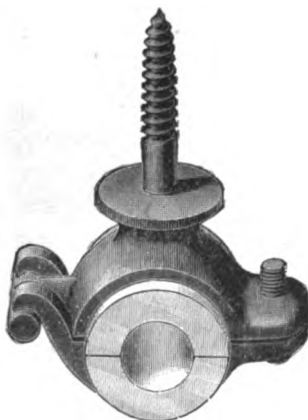
PORCELAIN INSULATION.



Patented.

No. 482.	$\frac{1}{4}$ inch opening,	per 100	.....	\$10.00
" 483.	$\frac{3}{8}$ " " "	" " "	.....	15.00

OPALESCENT GLASS INSULATION.

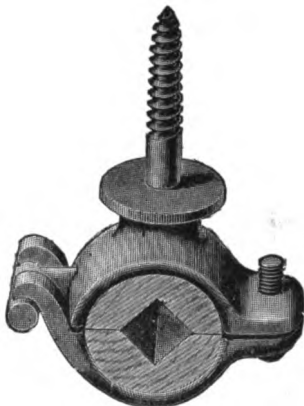


Patented.

No. 487.	$\frac{1}{2}$ inch opening,	per 100	.....	\$20.00
" 488.	$\frac{5}{8}$ " " "	" " "	.....	20.00
" 489.	$\frac{3}{4}$ " " "	" " "	.....	25.00
" 490.	$\frac{7}{8}$ " " "	" " "	.....	25.00
" 491.	1 " " "	" " "	.....	25.00
" 493.	$1\frac{1}{4}$ " " "	" " "	.....	50.00
" 494.	$1\frac{1}{2}$ " " "	" " "	.....	60.00

## FLETCHER'S WIRE HOLDERS.

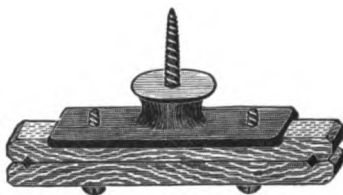
Wood Insulation.



Patented.

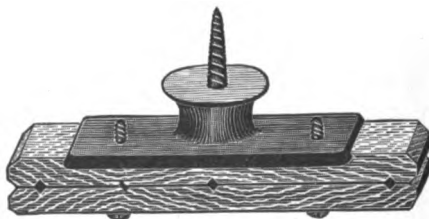
The Fletcher Gem Wire Holders, with wood insulation, are suitable for every description of inside work, but are not recommended for outdoor use.

No. 478.	$\frac{3}{16}$ in. opening,	per 100.....	\$ 8.33
" 479.	$\frac{1}{4}$ in. " " .....		10.00



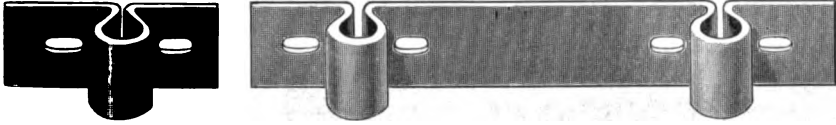
Patented.

No. 497.	Per 100.....	\$5.00
----------	--------------	--------

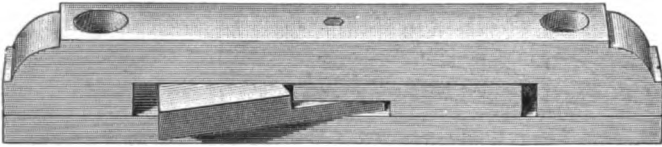


Patented.

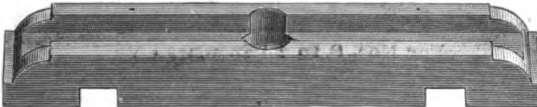
No. 498.	Per 100.....	\$6.50
----------	--------------	--------

**KARTAVERT INSULATING CLEATS.**

No. 1039.	Single, per 1,000.....	\$ 7.00
" 1040.	Double, " " .....	10.00

**AURORA WIRE CLEAT.**

No. 1000.	Per 1,000.....	\$15.00
-----------	----------------	---------

**CROSSING CLEAT.**

A neat, compact device. Permits crossing of lines safely and conveniently.

No. 993.	Per 1,000.....	\$20.00
----------	----------------	---------

**SELF-BINDING WIRE CLEAT.**

No. 1044.	Per 1,000.....	\$7.00
-----------	----------------	--------

## WOOD CLEATS.



For Nos. 00 to 5 Insulated Wire.

No. 991. Per 1,000 ..... \$5.00



For Nos. 6 and 7 Insulated Wire.

No. 992. Per 1,000 ..... \$4.50



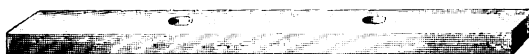
For Nos. 8 to 15 Insulated Wire.

No. 994. Per 1,000 ..... \$4.00



Under Cleat to fit Cleat No. 992.

No. 1092. Per 1,000 ..... \$3.75



Under Cleat to fit Cleat No. 994.

No. 1094. Per 1,000 ..... \$3.50

# WOOD CLEATS

*Continued.*



For Nos. 16 to 20 Insulated Wire.

No. 995. Per 1,000 .....\$3.75



For Nos. 16 to 20 Insulated Wire.

No. 999. Per 1,000 .....\$3.75



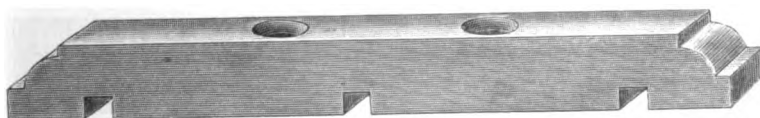
For Nos. 10 to 20 Insulated Wire.

No. 1043. Per 1,000 .....\$3.00



For Nos. 8 to 12 Insulated Wire.

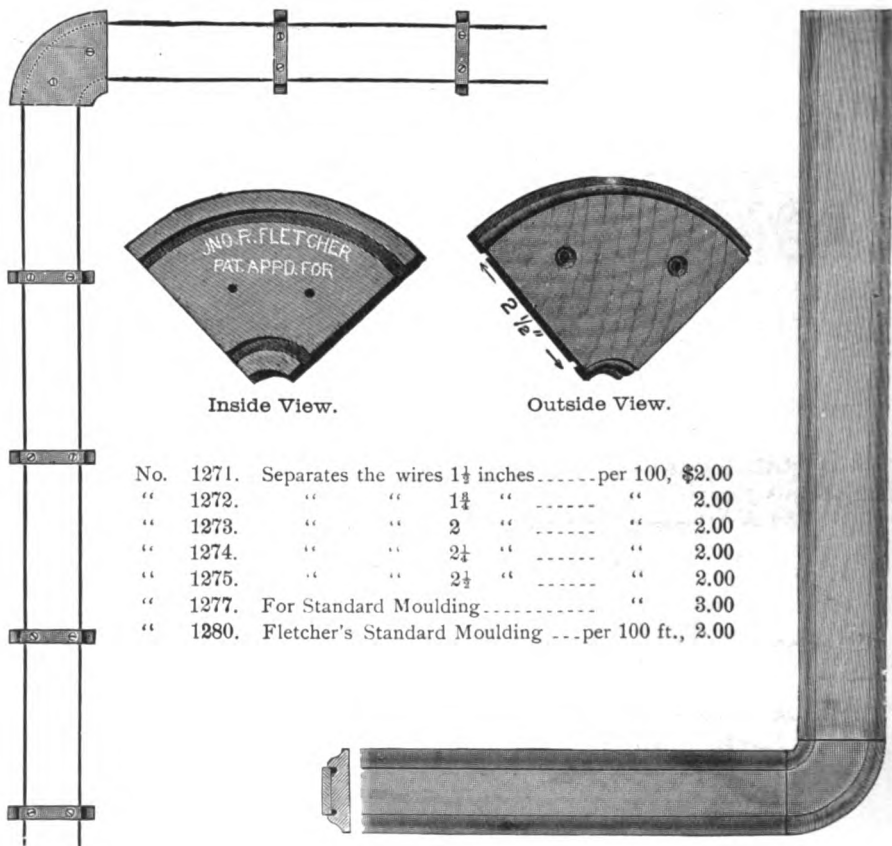
No. 1041. Per 1,000 .....\$5.00



For Nos. 12 to 20 Insulated Wire.

No. 1042. Per 1,000 .....\$4.50

## FLETCHER'S CORNER CLEATS.



These Cleats for open work are made of best quality seasoned maple.

The Standard Moulding and Corner Cleats for Moulding are made of well-seasoned poplar, and will take on any finish desired.

In using Fletcher's Corner Cleats the time saved by construction men will fully repay their cost.

## INSULATING SADDLE STAPLES.

A Steel Staple with Fibre Saddle can be driven without special tool.

No. 1393.	For wire	$\frac{1}{100}$ -inch diameter,	per 1,000	.....	\$5.00
" 1394.	"	$\frac{2}{100}$	" " "	.....	6.00
" 1395.	"	$\frac{5}{100}$	" " "	.....	8.50

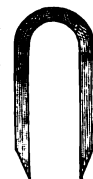


## THE "SAFETY" INSULATING STAPLES.

Made of the best insulating material, which will not cut the insulation of the wire, but rather strengthen the insulation where there is a contact.

Put up in boxes of 100, ten boxes in each package.

No. 1381.	For wire	$\frac{5}{100}$ -inch diameter,	per 1,000	.....	\$6.70
" 1382.	"	$\frac{1}{100}$	" " "	.....	7.10
" 1383.	"	$\frac{1}{100}$	" " "	.....	7.50
" 1384.	"	$\frac{2}{100}$	" " "	.....	8.00
" 1385.	"	$\frac{2}{100}$	" " "	.....	8.35
" 1386.	"	$\frac{3}{100}$	" " "	.....	8.75



## SAFETY DRIVING TOOL.

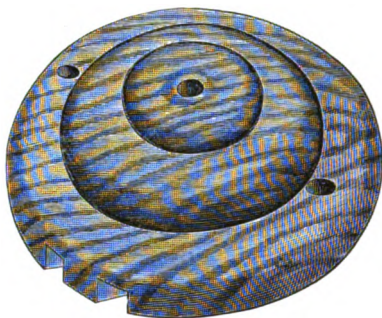


Style No. 1391.

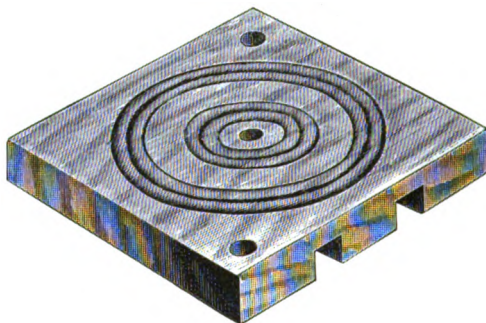
Each size of Safety Staple requires a separate Driving Tool. In ordering, mention the trade number of the staple which it is to drive.

Price.....each, \$2.50

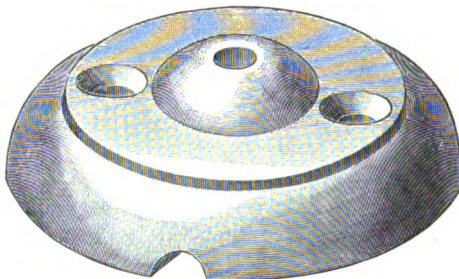
## CEILING ROSETTES.



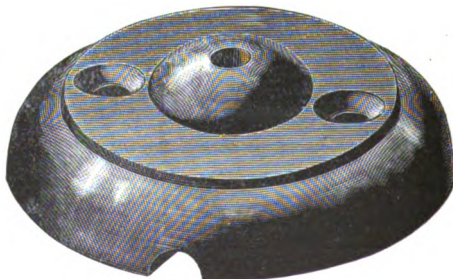
No. 1290 .....each, \$0.07½



No. 1291 .....each, \$0.07



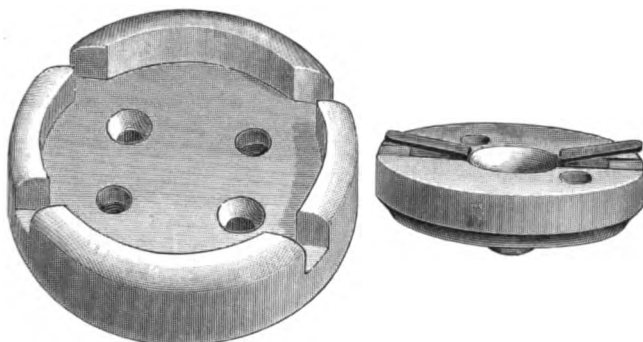
No. 1289. Porcelain .....each, \$0.10



No. 1288. Mottled .....each, \$0.10

## WIRT CEILING ROSETTE.

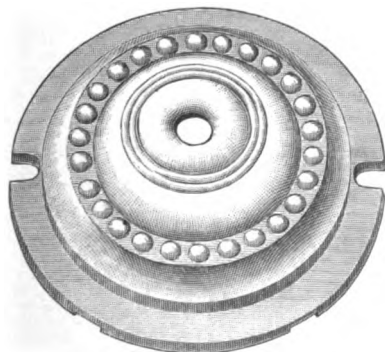
Patent Applied For.



This Rosette contains no fuse, and is intended for that class of work where it is preferred to place the fuses elsewhere than in the Ceiling Rosette. It is designed particularly for perfect connection, thorough insulation, and saving of labor in placing. Another point in its favor is that it can not be used by a slovenly workman to support the wires and do work that should be done by cleats, or moldings, or insulators. These Rosettes will pay for themselves in the saving of time over the old method of soldering, and as the back piece has no metallic part attached to it, the insulation afforded is superior.

No. 794. .... each, \$0.20

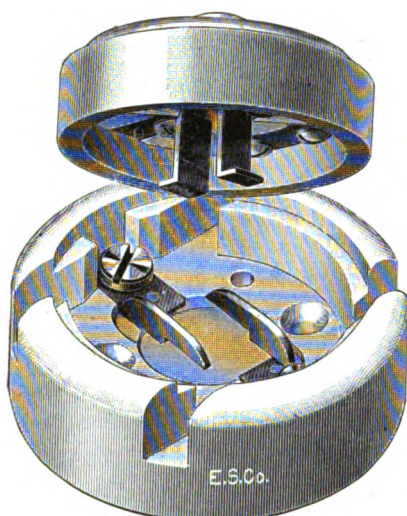
## ORNAMENTAL CEILING ROSETTE.



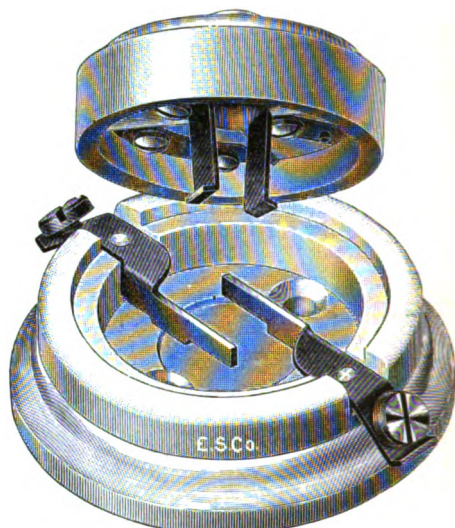
No. 797. Porcelain ..... each, \$0.15

## D.-W. DETACHABLE CUT-OUT.

Patented June 2, 1891.



No. 2972.



No. 2973.

This Cut-out is our own design, and will be found more simple than most Cut-outs on the market, and satisfactory in every particular.

No. 2972.	Inside connection	.....	each, \$0.36
" 2973.	Outside	" .....	" .36

## DETACHING CUP.

FOR D.-W. CUT-OUTS.

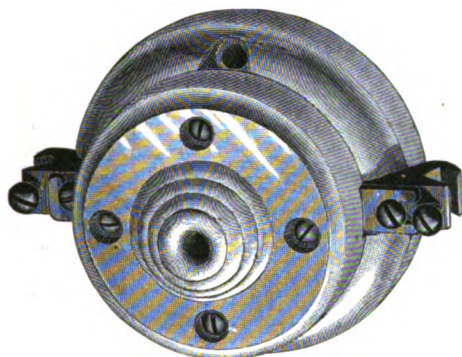


No. 2971.

By the use of this device Cut-outs can be detached from ceiling and replaced without the use of step-ladder.

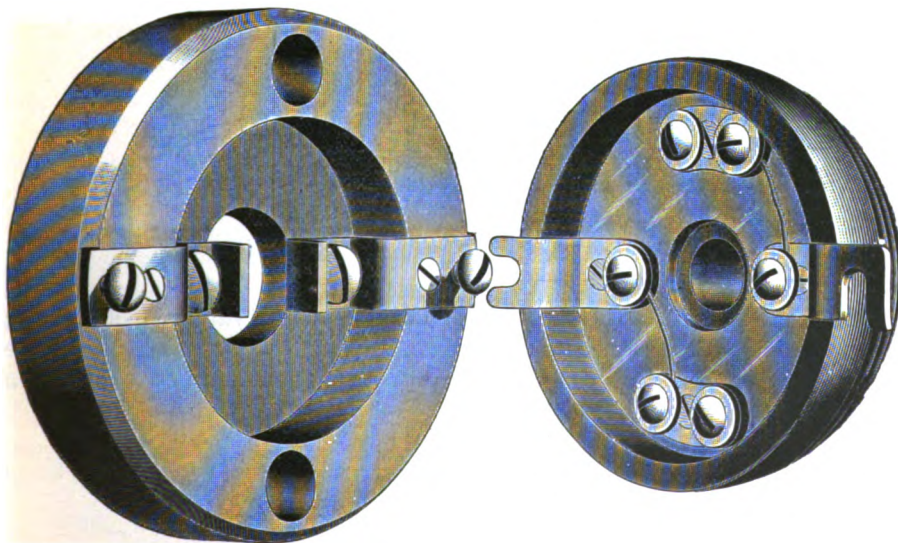
No. 2971.	.....	each, \$2.00
-----------	-------	--------------

## K. W. DETACHABLE CUT-OUT.



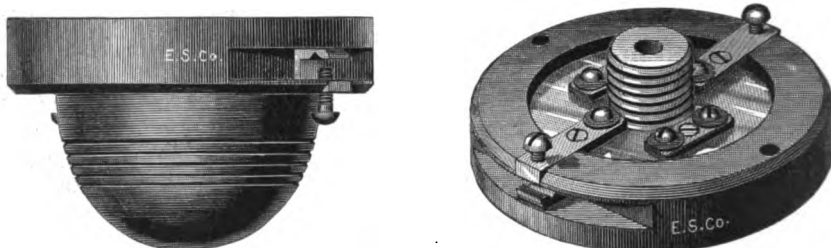
No. 875 ..... each, \$0.40

## K. W. BRACKET CUT-OUT.



No. 3945 ..... each, \$0.70

## DOUBLE POLE FUSE ROSETTE.



The advantage of this construction is that the leading wires may pass on from one rosette to the next, and the insulation may merely be pierced or removed for a very short distance for the attachment of the tap hook at the sides. The cord may be connected directly to one terminal, thus using but one fuse, or the contact plates may be used in both cases, and two fuses used to connect same.

No. 879. Price .....each, \$0.24

## WIRT CEILING ROSETTE AND SWITCH.



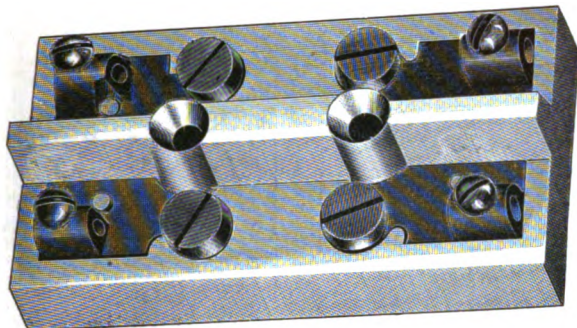
This is an ingenious combination of ceiling rosette and snap switch.

It combines all the ordinary features of a ceiling rosette with a device for switching the current on or off. A light silk, or linen cord, with an ornamental tip, hangs within reach. The action is easy, without strain; one pull turns on the current, the next turns it off. The cap is detachable, fastening with a twist lock, and making a firm rubbing contact. It holds the fuse wires, switch, and lamp cord terminals. Will be found specially desirable where lamps are to be placed at a height above easy reach.

No. 799. Hard Wood .....each, \$1.10

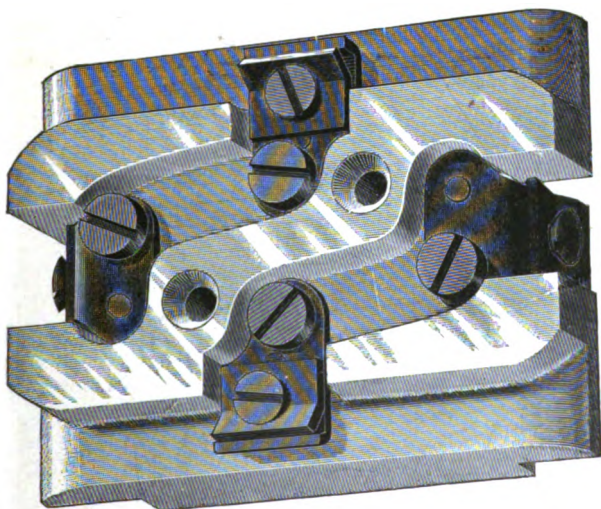
Will be furnished in porcelain later.

## MAIN LINE CUT-OUTS.



No. 3964.	10 Amperes, Porcelain Base	.....	each, \$ .50
" 3965.	25 " " "	.....	" .60
" 3966.	50 " " "	.....	" 1.00
" 3967.	100 " " "	.....	" 1.60

## BRANCH CUT-OUTS.



No. 3968.	10 Amperes, Porcelain Base	.....	each, \$ .50
" 3969.	25 " " "	.....	" .65
" 3970.	50 " " "	.....	" 1.10

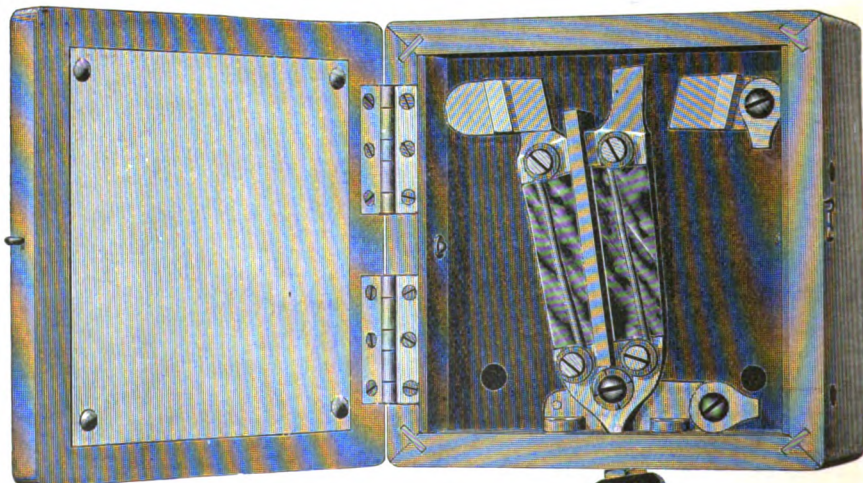
## MAIN LINE CUT-OUTS.

(With Cover.)



No. 2994.	Capacity,	10 Amperes, all porcelain	.....	each, \$1.00
" 2995.	"	20 " "	.....	" 1.00
" 2996.	"	50 " "	.....	" 2.00
" 2997.	"	100 " "	.....	" 3.00

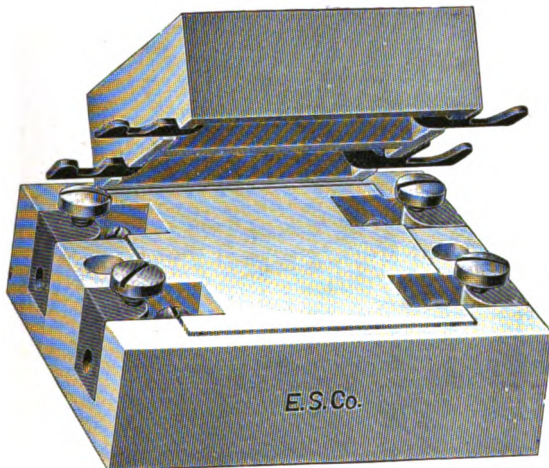
## WOOD'S DUPLEX FUSE BOX.



This Box is arranged with double fuse on one insulated switch blade. The two upper clips are so connected that only one fuse can be in circuit at a time. When a fuse is blown, second fuse can be switched into circuit and blown fuse replaced without danger of receiving a shock.

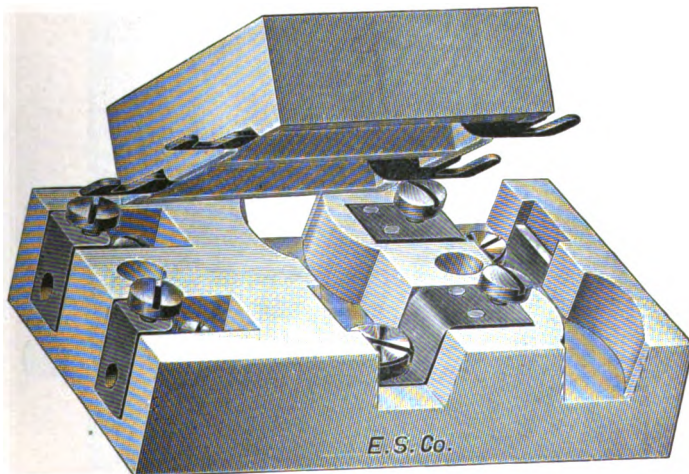
No. 4112.....each, \$10.00

## K. W. MAIN LINE CUT-OUTS.



No. 3944. 30 Amperes .....each, \$1.40

## K. W. BRANCH CUT-OUTS.

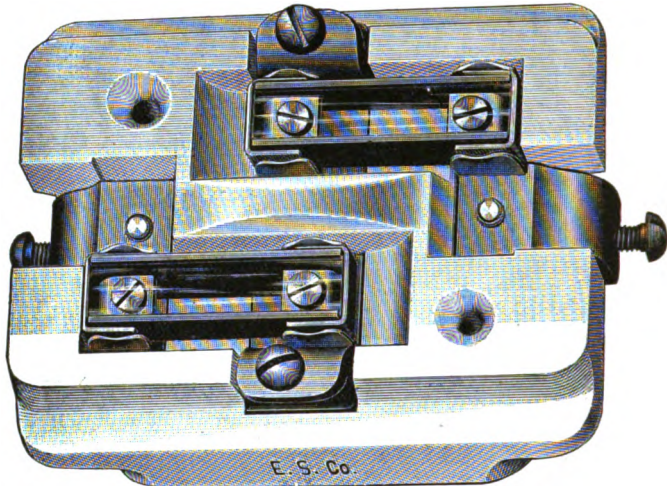


No. 3941. 10 Amperes .....each, \$0.90

" 3942. 30 " ..... " 1.50

BRANCH CUT-OUT.

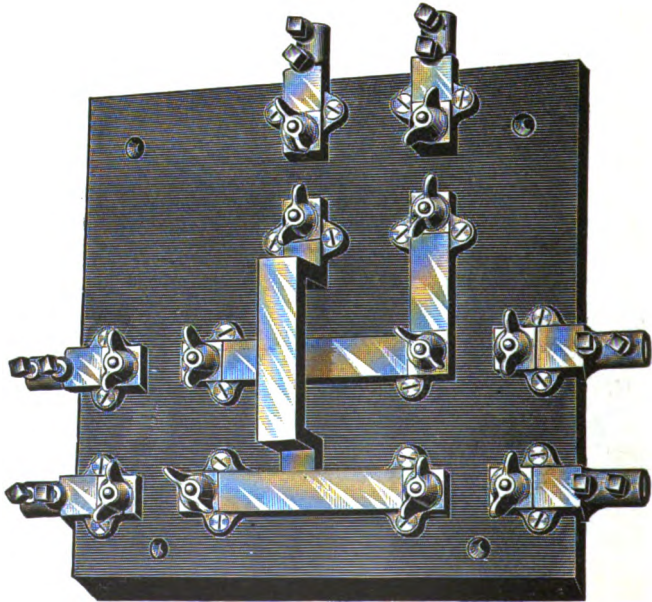
DOUBLE POLE. WITH DETACHABLE FUSE LINKS.



This Cut-Out has many advantages over the ordinary form, the chief of which is that a fuse link may be replaced very quickly and without the use of a screw driver. The fuse wire is entirely enclosed, preventing the spatter of melted metal when fused by a short circuit, and inspection is provided for by making a transparent cover to the fuse box.

No. 2988.	Capacity, 25 Amperes, porcelain base	.....	each, \$1.25
" 2988F.	Mica Fuses only	.....	" .12

STRIP CUT-OUT.



Capacity 200 Amperes.

No. 2992.	Two wire, slate base	.....	each, \$18.75
" 2992W.	" " wood "	.....	" 16.00
" 2993.	Three " slate "	.....	" 27.00
" 2993W.	" " wood "	.....	" 24.00

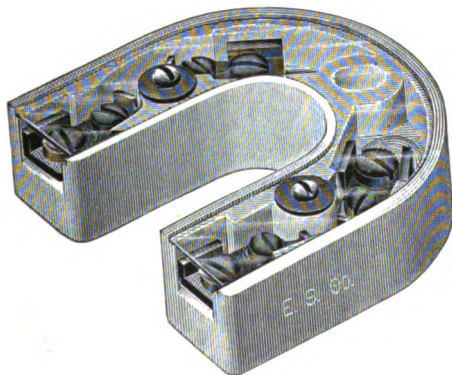
## FIXTURE CUT-OUTS.



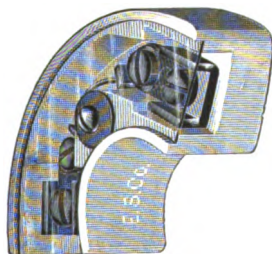
- No. 2981. Single Pole, diameter  $2\frac{1}{4}$  inches ..... each, \$0.50  
 " 2982. Double " " " " ..... " .60



- No. 2983. Single Pole, length  $2\frac{1}{4}$  inches, width  $\frac{3}{4}$  inches ..... each, \$0.32



- No. 2984. Double Pole, length  $2\frac{1}{4}$  inches, width  $2\frac{1}{4}$  inches ..... each, \$0.60

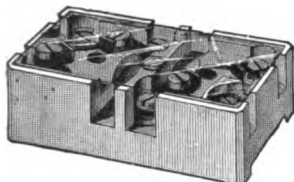


- No. 2985. Single Pole, length  $2\frac{1}{4}$  inches, width  $\frac{3}{4}$  inches ..... each, \$0.32

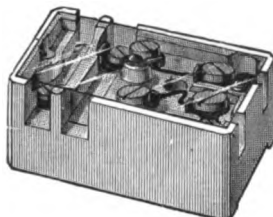


## CUT-OUTS FOR LINK FUSES.

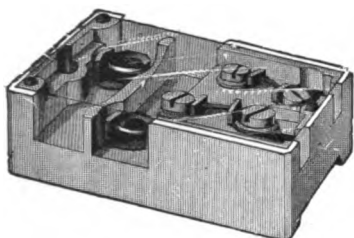
On Porcelain Bases and with Mica Covers.



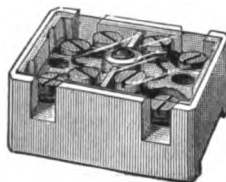
No. 3008. Double Branch,  
Double Pole Cut-  
out.....each, \$1.05



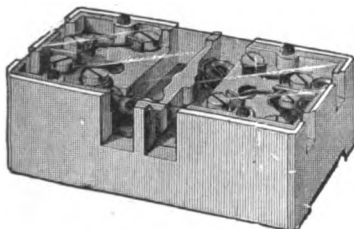
No. 3009. Single Branch,  
Double Pole Cut-  
out .....each, \$0.90



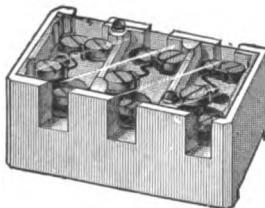
No. 3010. Branch Double Pole  
Cut-out, with extra  
large connectors for  
Main Wires...each, \$1.15



No. 3011. Main Line Double  
Pole Cut-out, each, \$0.77



No. 3012. Double Pole, Dou-  
ble Branch Cut-  
out.....each, \$1.80



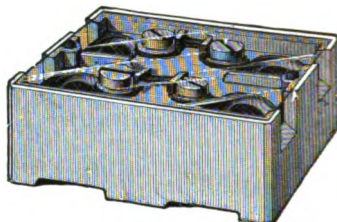
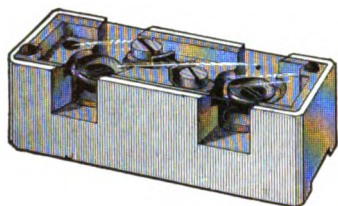
No. 3013. Three-Wire Main  
Line Cut-out...  
.....each, \$1.10

The above Cut-outs are for one to twenty-five amperes, and are designed to protect a circuit of not over 125 volts. Use Fuse Links illustrated and described on page 366.

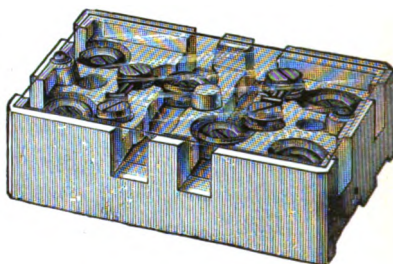
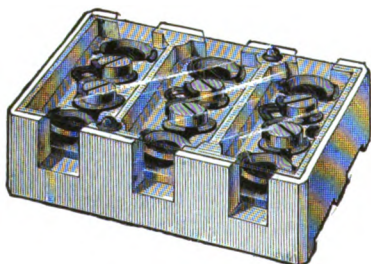
## CUT-OUTS FOR LINK FUSES

*Continued.*

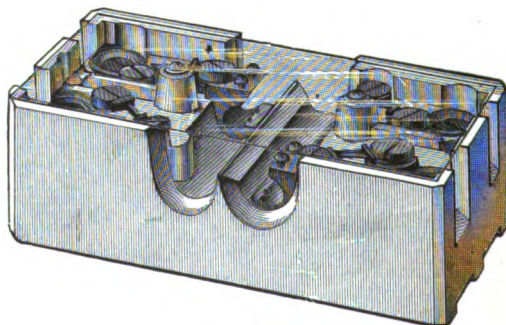
On Porcelain Bases and with Mica Covers.



- No. 3015. Single Pole Cut-out .....each, \$1.10  
 " 3016. Main Line Double Pole Cut-out ..... " 1.65



- No. 3017. Three-Wire Main Line Cut-out .....each, \$2.25  
 " 3018. Double Branch Double Pole Cut-out..... " 2.25



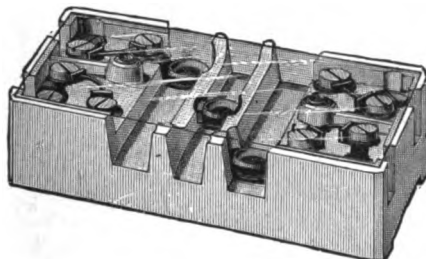
- No. 3019. Double Pole Double Branch Cut-out.....each, \$6.25

The above Cut-outs are for one to sixty-five amperes, and are designed to protect a circuit of not over 125 volts. Use Fuse Links illustrated and described on page 366.

## CUT-OUTS FOR LINK FUSES

*Continued.*

On Porcelain Bases and with Mica Covers.



No. 3014. Three-Wire Multiple-Arc Cut-out.....each, \$1.80

The above Cut-out is for one to twenty-five amperes, and is designed to protect a circuit of not over 125 volts. Use Fuse Links illustrated and described on page 366.

## SAFETY PLUG.

EDISON SYSTEM.

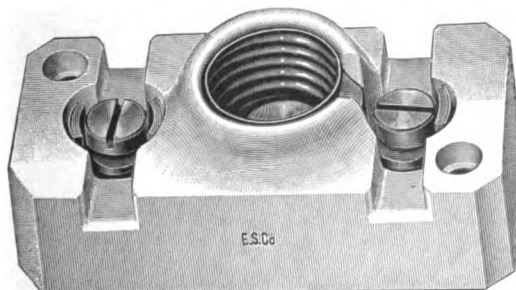


No. 3033. Glass.....each, \$0.13

In ordering, state capacity in amperes.

## PLUG CUT-OUTS.

EDISON SYSTEM.



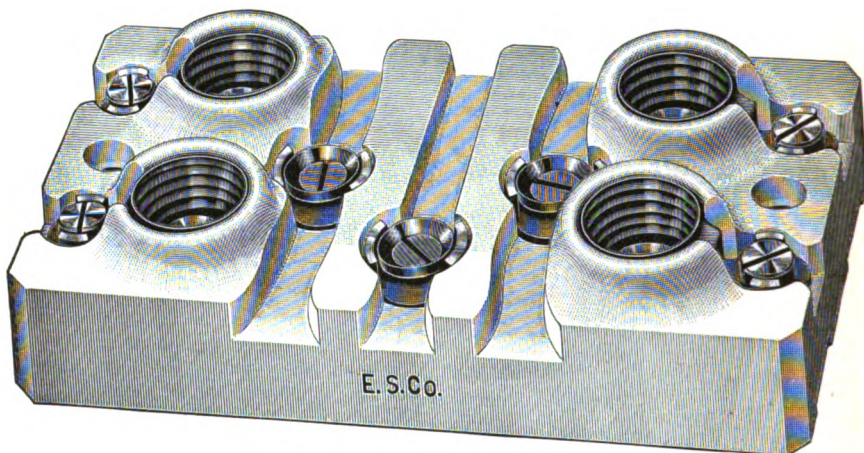
No. 3025. Single Pole or Receptacle Cut-out.....each, \$0.46

The above Cut-out is for one to fifteen amperes, and is designed to protect a circuit of not over 125 volts. Use Safety Plug No. 3033, page 183.

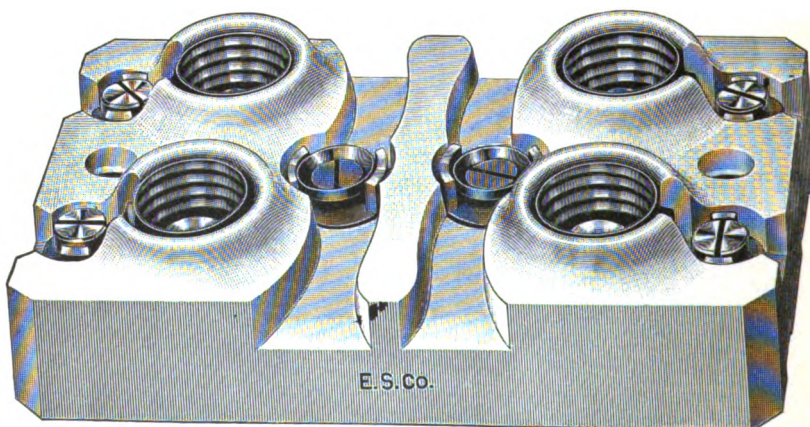
## PLUG CUT-OUTS

*Continued.*

EDISON SYSTEM.



No. 3020. Three-wire, Multiple Arc Cut-out ..... each, **\$1.80**



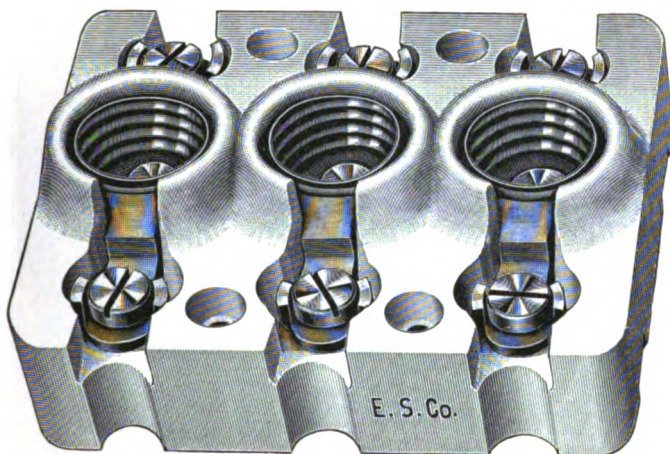
No. 2587. Two-Branch Double Pole Cut-out ..... each, **\$1.35**

The above Cut-outs are for 1 to 15 Amperes, and are designed to protect a circuit of not over 125 volts. Use Safety Plug No. 3033, page 183.

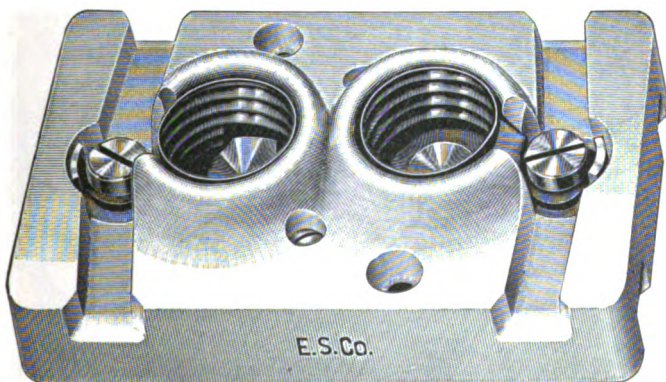
## PLUG CUT-OUTS

*Continued.*

### EDISON SYSTEM.



No. 3021. Three Wire, Main Line Cut-out .....each, \$1.00



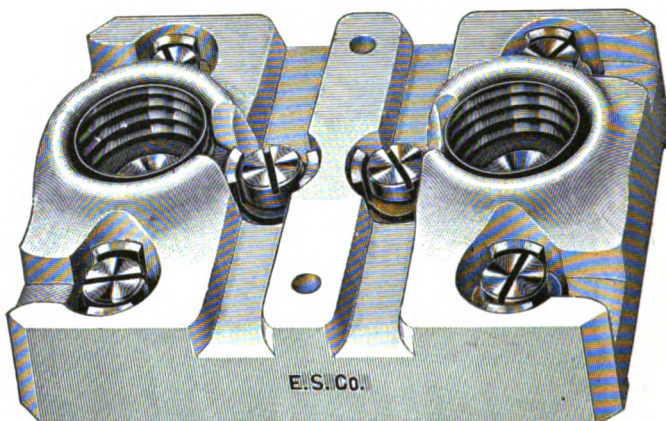
No. 3022. Branch Double Pole Cut-out, for cleat work .....each, \$0.80

The above Cut-outs are for one to fifteen amperes, and are designed to protect a circuit of not over 125 volts. Use Safety Plug No. 3033, page 183.

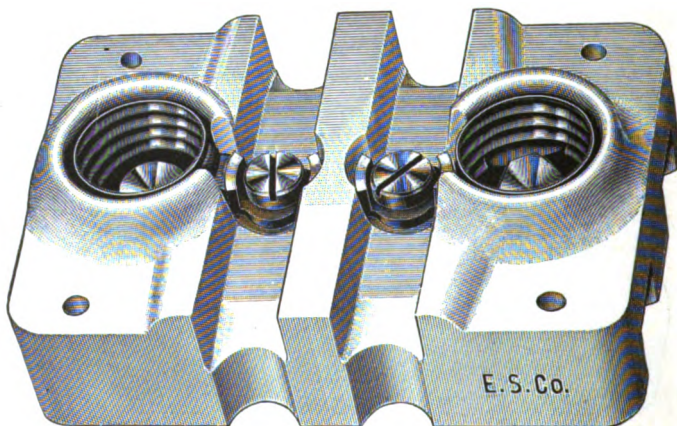
## PLUG CUT-OUTS

*Continued.*

### EDISON SYSTEM.



No. 3023. Branch Double Pole Cut-out, with all surface connections.....each, \$1.05



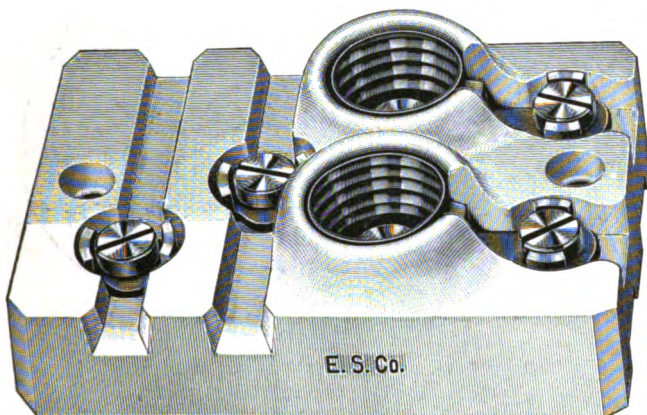
No. 3024. Branch Double Pole Cut-out.....each, \$0.80

The above Cut-outs are for one to fifteen amperes, and are designed to protect a circuit of not over 125 volts. Use Safety Plug No. 3033, page 183.

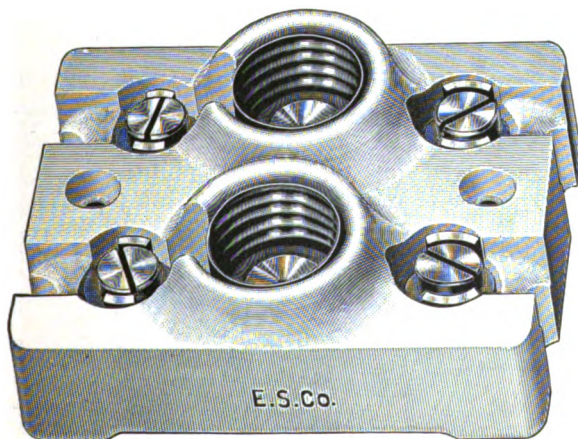
## PLUG CUT-OUTS

*Continued.*

### EDISON SYSTEM.



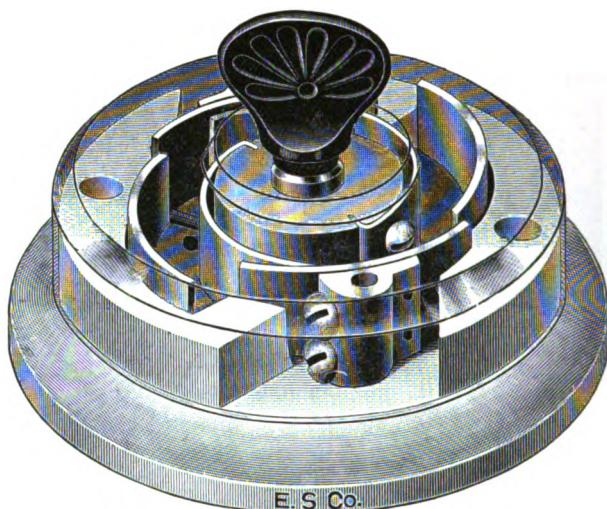
No. 2588. Single Branch Double Pole Cut-out, with all surface connections; specially adapted for Switch Board work, each, \$0.80



No. 2589. Main Line Double Pole Cut-out.....each, \$0.70

The above Cut-outs are for one to fifteen amperes, and are designed to protect a circuit of not over 125 volts. Use Safety Plug No. 3033, page 183.

## WIRT INCANDESCENT SNAP SWITCH.

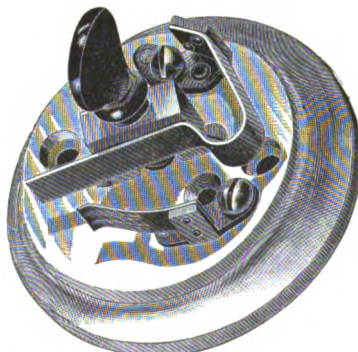


This switch is single pole and double break, and has an extremely powerful, rapid snap action. The number of contacts is reduced to two, being the contacts which are made and broken by the action of the switch. It has no equal for simplicity of design, directness of action, and capacity for a given size. Is composed entirely of metal and porcelain. For a given size this switch will do about double the amount of work of any other switch, and can be depended upon to work continuously without getting out of order or making bad contact. It is not subject to deterioration from dampness, and will do good work in places which would soon break down any other switch. The terminals are arranged to take the wires straight through from below, no twisting or worming of the wires being necessary to introduce and connect them.

No. 778.	10 Amperes,	porcelain base	.....	each,	\$1.00
" 779.	20	"	"	"	1.60

## E. S. INCANDESCENT SNAP SWITCH.

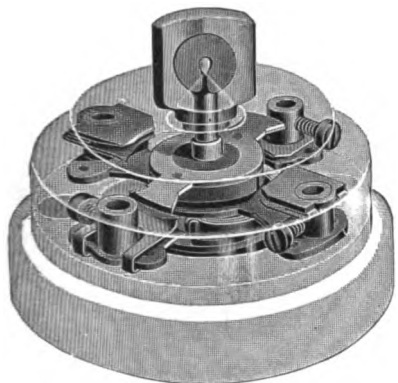
SINGLE POLE.



Wide break, making it suitable for high E. M. F.

No. 792.	10 Amperes,	porcelain base	.....	each,	\$0.75
----------	-------------	----------------	-------	-------	--------

## HART INCANDESCENT SNAP SWITCHES.



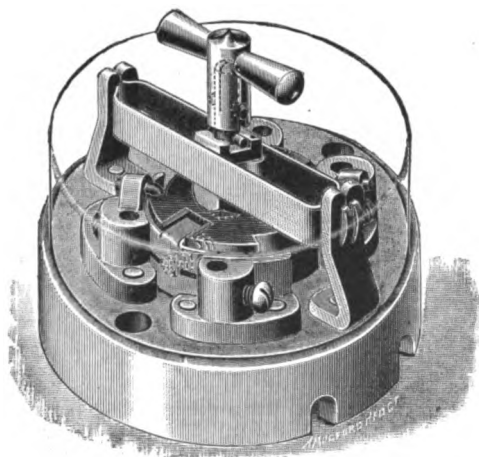
These switches are mounted on porcelain bases. The movement is rotary in one direction by quarter turns, keeping contacts bright and giving the maximum length of break. The current passes from one contact to another through solid metal and not through pivoted joints. The break is double in all sizes, the current is therefore broken at four points by the double pole switch.

The double pole switches are good up to 500 volts, continuous current, or 1,000 volts alternating.

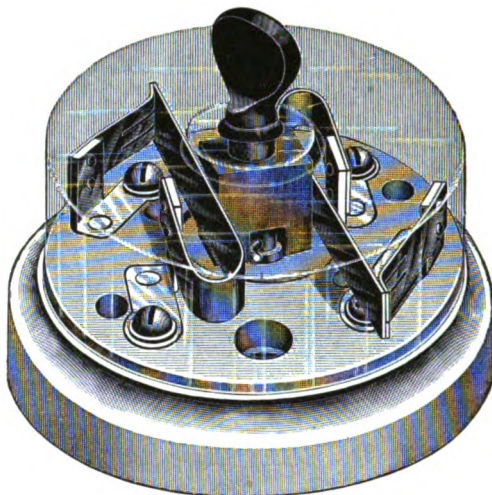
No. 771.	5 Amperes, single pole	.....	each, \$ .75
" 772.	10 " " "	.....	" 1.00
" 774.	15 " double "	.....	" 2.40
" 775.	30 " " "	.....	" 4.00
" 776.	40 " " "	.....	" 5.50

## PERKINS INCANDESCENT SNAP SWITCHES.

For neatness, compactness, and general excellence of design this switch has no superior. The arrangement of the snap action is such as to secure positive and broad rubbing contacts, having a lightning make and break.



No. 823.	5 Amperes, single pole	.....	each, \$ .75
" 824.	10 " " "	.....	" 1.00
" 825.	15 " double "	.....	" 2.40
" 826.	30 " " "	.....	" 4.00
" 827.	40 " " "	.....	" 5.50
" 828.	75 " " "	.....	" 12.00
" 829.	150 " " "	.....	" 20.00
" 830.	5 " 3-way switch	.....	" 2.50

**E.-S. INCANDESCENT SNAP SWITCH.****DOUBLE POLE.**

No. 793.	10 Amperes,	Porcelain Base	.....	each,	\$2.00
" 798W. 10	"	Wood	.....	"	1.80

**THE WIRT LAMP REGULATING SWITCH.**

The incandescent light has patiently borne the reproach of being non-controllable for no other reason than because controlling mechanism was either expensive or troublesome and unreliable. The Wirt Regulating Switch will alter this by making the electric light controllable "the same as gas." With it, it is possible to light, graduate, and extinguish a lamp, leaving nothing to be desired in the way of convenience and perfect action. It is intended to control a single light, and will be found particularly advantageous for bedrooms, nurseries, etc., and in fact in all places where a light that can be graduated is desirable. It can be put in place of an ordinary switch, and is as easy to connect and as simple to operate. It is desirable, of course, that it should be placed at the most convenient point, which would generally be the entrance to the room. The principle is entirely different from that of any other device of its class, and it is very simple and solidly built, no wire coils or carbon resistances being used in its construction, and nothing but fire-proof material entering into it.

No. 768.	For one 16 candle lamp of 90 to 115 volts	.....	\$5.00
" 769.	" 16 " " 50 to 60 volts	.....	5.00

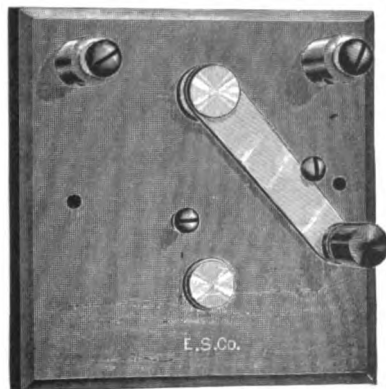
## PUSH BUTTON SWITCH.



Is convenient for use in bed rooms or other places where it is not desirable to fasten permanently to the wall.

No. 766. 3 Amperes ..... each, \$1.15

## PLAIN ELECTRIC LIGHT SWITCH.



No. 801. 15 Amperes ..... each, \$1.30

## MIDGET INCANDESCENT KNIFE SWITCH.

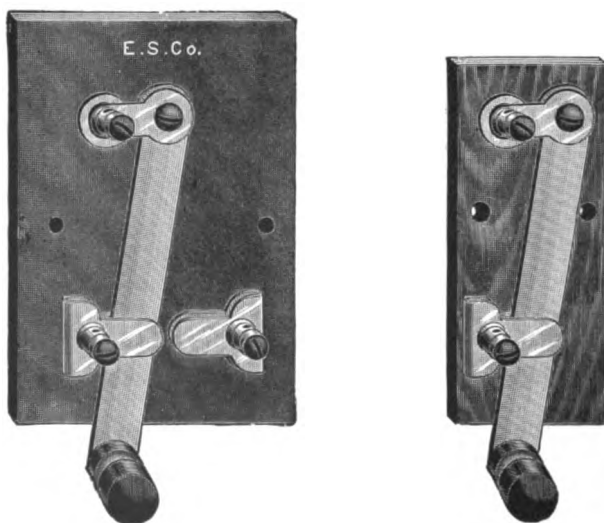


Cut Full Size.

This switch is particularly designed for office and factory use, is easily wired, and has all parts in plain sight for convenience of inspection. Has quick break and is mounted on polished hard rubber.

No. 780. Five Amperes, hard rubber base.....each, \$0.40

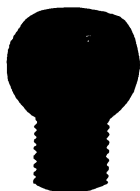
## PLAIN INCANDESCENT SWITCH.



No. 832, double, can be used as three-way switch for turning on or off lights from two different points.

No. 831. Five Amperes, single, wood base .....each, \$0.45  
 " 832. " " double, " " ..... " .50

## INSULATING NOZZLES AND BUSHINGS.



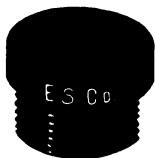
Insulates lamp socket from fixture.

No. 3926.	Fibrone, $\frac{1}{8} \times \frac{1}{8}$ in. thread, per 100	\$5.50
" 3927.	Rubber, $\frac{1}{8} \times \frac{1}{8}$ in. thread, per 100	7.50



Extra heavy rubber, for insulating and reducing purposes.

No. 3928.	$\frac{1}{8} \times \frac{1}{8}$ in. thread, per 100	\$12.00
" 3929.	$\frac{1}{4} \times \frac{1}{8}$ in. thread, per 100	16.00
" 3930.	$\frac{3}{8} \times \frac{1}{8}$ in. thread, per 100	20.00



Rubber, for reducing.

No. 3612.	$\frac{3}{8} \times \frac{1}{4}$ in. thread, per 100	\$12.00
" 3613.	$\frac{1}{2} \times \frac{3}{8}$ in. thread, per 100	15.00



When used to insulate socket from fixture allows wiring through the side of the nozzle.

No. 3615.	$\frac{1}{8} \times \frac{1}{8}$ in. thread, per 100	\$12.00
" 3616.	$\frac{1}{4} \times \frac{1}{8}$ in. thread, per 100	16.00
" 3617.	$\frac{3}{8} \times \frac{1}{8}$ in. thread, per 100	20.00



Used to prevent cutting of the insulation of incandescent cord at the socket.

No. 3931.	Black Enamel, $\frac{1}{8}$ in. thread, per 100	\$3.50
" 3932.	Rubber, $\frac{1}{8}$ in. thread, per 100	7.00

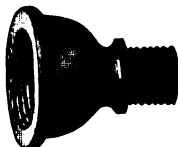


Prevents cutting of insulation of incandescent cord at the socket.

No. 3933.	Soft rubber, per 100	\$3.75
-----------	----------------------	--------

## REDUCING NOZZLES.

For Reducing Different Sizes of Pipes to Fit Sockets.



No. 3946. Brass,  $\frac{3}{8}$  x  $\frac{1}{8}$  inch ..... each, \$0.16  
 " 3947. "  $\frac{1}{4}$  x  $\frac{1}{8}$  " ..... " .15



No. 3084. Iron,  $\frac{3}{8}$  x  $\frac{1}{8}$  inch ..... each, \$0.11  
 " 3085. "  $\frac{1}{4}$  x  $\frac{1}{8}$  " ..... " .10

## CLOSE NIPPLE.



No. 3087. Iron,  $\frac{3}{8}$  inch ..... each, \$0.10

## SHOULDER NIPPLE.



No. 3089. Iron,  $\frac{3}{8}$  x 1 in. long ..... each, \$0.09  
 " 3090. "  $\frac{3}{8}$  x 2 " ..... " .09  
 " 3091. "  $\frac{3}{8}$  x 3 " ..... " .09

## ELBOW NOZZLE.

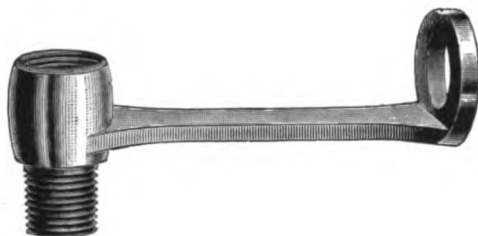


No. 3093. Brass,  $\frac{3}{8}$  x  $\frac{1}{4}$  inch ..... each, \$0.18

## GAS-FIXTURE ATTACHMENTS.



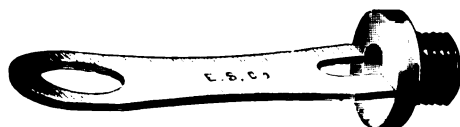
No. 2356..... each, \$0.25



No. 2350..... each, \$0.25



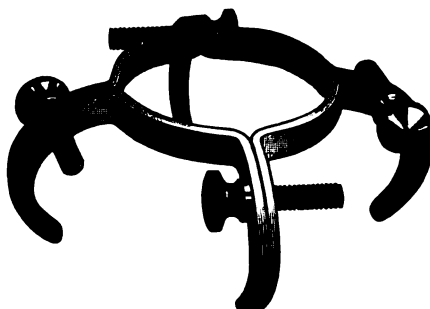
No. 2355..... each, \$0.20



No. 2353..... each, \$0.14

For Insulating Bushings for Gas Attachment, see page 193.

## WIRT UNIVERSAL SHADE HOLDER.



This Shade Holder has a wide range of adjustment, and *will fit all styles of sockets*, from the smallest to the largest. A screw driver is not used in putting it on or taking it off, and when placed it holds the shade with a grip that no amount of shaking or handling will loosen.

No. 3934.	2 $\frac{1}{4}$ inch, per 100	-----	\$12.00
" 3975.	3 $\frac{1}{4}$ " " "	-----	16.50

## SHADE HOLDER.



Trade No.	To Fit Socket.	Shade Opening.	Collar.	Price per Hundred.
3935	Brush-Swan .....	2½ inches.	1½ inches.	\$12.00
3936	“ “ .....	3¼ “	1½ “	16.50
3937	Thomson-Houston ..	2½ “	1½ “	12.00
3938	“ “ .....	3¼ “	1½ “	16.50
3937	Westinghouse .....	2½ “	1½ “	12.00
3938	“ “ .....	3¼ “	1½ “	16.50
3937	Sawyer-Man .....	2½ “	1½ “	12.00
3938	“ “ .....	3¼ “	1½ “	16.50
3937	United States .....	2½ “	1½ “	12.00
3938	“ “ .....	3¼ “	1½ “	16.50
3939	Edison .....	2½ “	1½ “	12.00
3940	“ “ .....	3¼ “	1½ “	16.50
3939	Schaeffer .....	2½ “	1½ “	12.00
3940	“ “ .....	3¼ “	1½ “	16.50
3939	Mather .....	2½ “	1½ “	12.00
3940	“ “ .....	3¼ “	1½ “	16.50

## SHADE HOLDER.



No. 3977. 4 inch, per 100 .....\$35.00

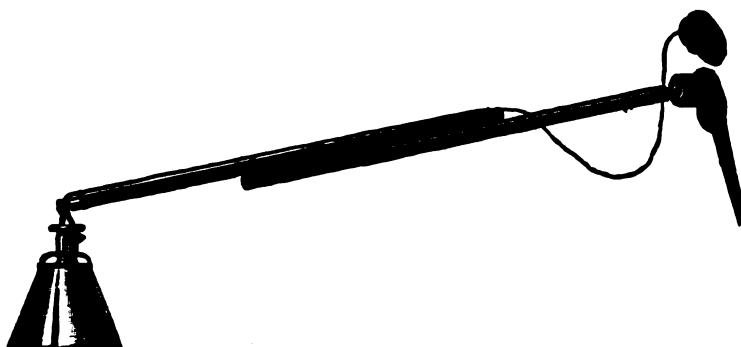
## WOOD'S ATTACHMENT PLUG AND RECEPTACLE.



Made of hard rubber, nicely finished. The flexible cord terminals can be more easily and quickly secured in this plug than with any other made.

No. 3713 .....	each, \$2.50
" 3713R. Receptacle only .....	" 1.00
" 3713P. Plug only .....	" 1.50

## THE "I. M. B." ADJUSTABLE LAMP SUPPORT.



For adjusting incandescent lights at any angle desired, and to raise and lower at will. Particularly serviceable for factory and shop use.

No. 3556.	3 ft. long, for rooms with	9 to 10 ft. ceiling	.....	each, \$2.50
" 3557.	4 " " " " "	10 to 11 " "	.....	" 3.00
" 3558.	5 " " " " "	11 to 12 " "	.....	" 3.50
" 3559.	6 " " " " "	12 to 13 " "	.....	" 4.00

Prices do not include wiring, sockets, lamps, or shades.

## BRADNER ADJUSTABLE HANGER.

**The Electrical Supply Co. Sole Manufacturers.**

**Patented Nov. 26, 1889.**

**Patents applied for.**



The Bradner Adjustable Hanger is used in raising and lowering incandescent lamps. It works smoothly and easily, requiring no adjustment; is simple in construction, and as there are no springs or small parts there is no opportunity for it to get out of repair. It is one of the latest and most important adjuncts to perfection in incandescent lighting. The incandescent lamp cord, reaching to the lamp, passes through the sphere and around a differential pulley, and is taken up and played out in exact proportion as the lamp is raised or lowered, all the slack of the cord being taken up inside without kinks or disfigurement.

The Bradner Adjustable Hanger is designed for, and when once used is indispensable to, the residence, office, machine shop, printing establishment, barber shop, and, indeed, wherever a lamp is to be raised or lowered.

# BRADNER ADJUSTABLE HANGER

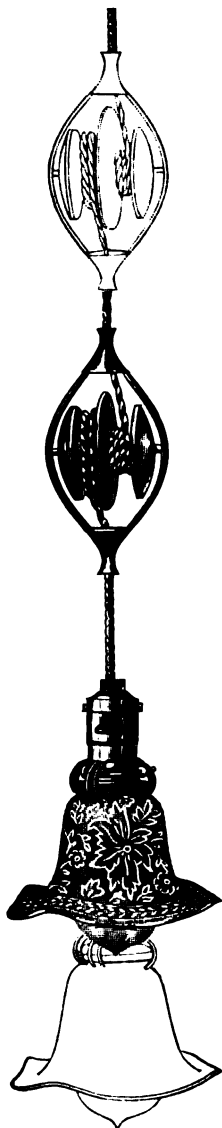
*Continued.*



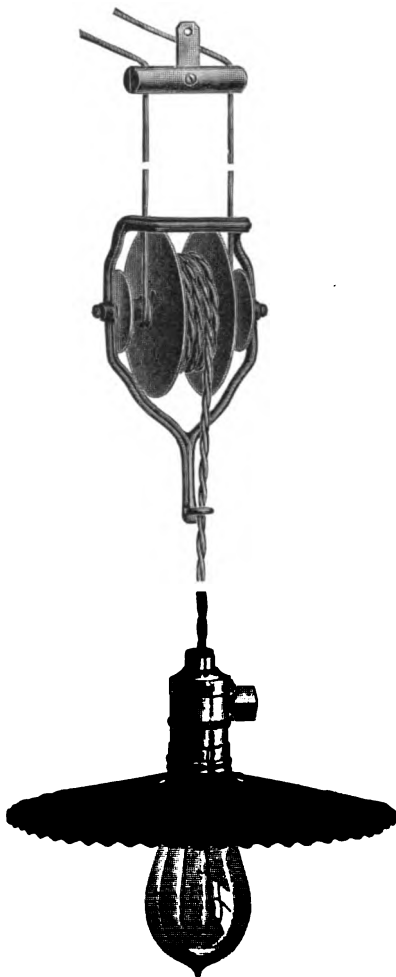
Style No. 3685.  
Enclosed, ornamental.  
Has a drop of four feet.



**Especially adapted for all single light pendants in offices, stores, libraries, etc.**

**BRADNER ADJUSTABLE HANGER***Continued.*

**Style No. 3685½. Open frame.**  
**Has a drop of four feet.**



**Style No. 3686. Long range.**  
**Has a drop of ten feet.**

These are designed for offices, engravers, printers, factory, and mill lights.

## BRADNER ADJUSTABLE HANGER

*Continued.*

### DIRECTIONS.—STYLE No. 3685.

The Hanger should be placed on the cord after the latter has been hung. Cut the cord to the length required to bring the lamp as low as desired; pass the cord through the shell with the bearings, and through the hole in the drum, from the smaller side to the larger; then wind the larger drum with as much cord as it will hold without crowding; pass the cord through the other shell. Place the pivot which is next the *larger* end of the drum in the *longer* bearing, snap the other pivot in place in its bearing by slightly springing the shell; then lock the shells together. The weight of the hanger is designed for a light lamp and shade. For a heavier lamp, lead washers are provided, which can be placed inside the drum.

The drum should revolve inside the shell without touching the latter.

Use Silk Cord not larger than No. 18 B. & S. No. 20 is preferable where it can be used, as lighter cord will give longer adjustment.

### DIRECTIONS.—STYLE No. 3685½.

Pass the lower end of the flexible cord through the end of the frame marked "top," then remove the drum by slightly springing the sides of the frame, and pass the end of the cord through the hole in the drum from the smaller side to the larger. Wind the larger side of the drum with as much cord as it can hold without crowding. Replace the drum in the frame, and pass the cord through the hole in the lower end of the frame.

No. 18 cord is suitable. No. 20 will give somewhat longer adjustment. The drum should revolve without touching the sides of the frame.

### DIRECTIONS.—STYLE No. 3686.

Untwist about one-fourth of the cord desired to use upon the drum into the two strands. Take the drum out of the frame, and pass each of the two strands (separated) through one of the two holes in the drums, from the larger drum to the smaller.

Wind the double cord upon the largest drum, leaving the single strands entirely unwound upon the smallest drums.

About three inches from the ends of the two single strands clamp on the separator, so that the drum will hang horizontally.

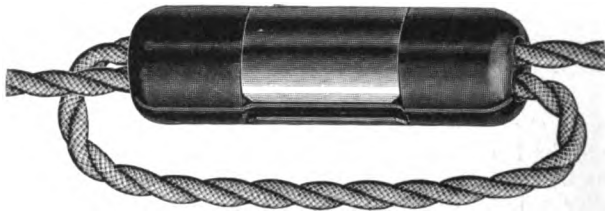
Place the drum in the frame, pass the double cord down through the guard, and connect to the lamp. Attach to the ceiling by the eye in the separator and connect up so that the separator will have perfect freedom to play as an evener.

This style is designed to work with a very light shade, or none at all. Any lamp cord may be used, but the smaller cord permits the greatest adjustment.

### PRICES.

		Each.	Per doz.
No. 3685.	Inclosed, ornamental, Polished Brass.....	\$1.50	\$17.00
" 3685C.	" " Turkish Copper.....	2.00	22.50
" 3685½	Open frame, Polished Brass .....	1.10	12.50
" 3686.	Long range, Nickel Finish .....	1.10	12.50

## WIRT FLEXIBLE CORD ADJUSTER.



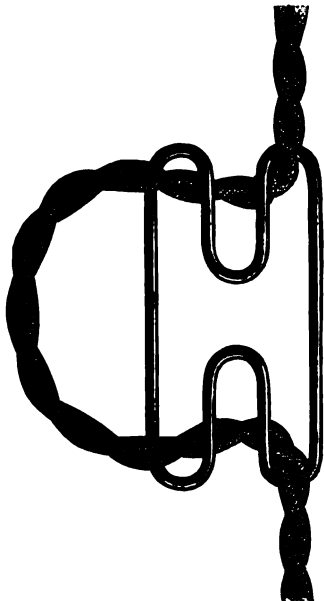
We consider this Adjuster the neatest and best yet offered to the trade. It has the following advantages over others:

- 1st. It can be placed on cord or removed without disconnecting the socket.
- 2d. It does not put a sharp bend in the cord, and will not kink it.
- 3d. It supports the weight of the socket entirely by friction, the cord being clamped between two parallel smooth-faced grooves by spring pressure.
- 4th. *The lamp can be lowered by a gentle pull, the friction allowing the cord to slide freely through the groove, while to raise the lamp it is only necessary to grasp the cord above and below and draw the same through the groove.*

*Do not use an inferior Adjuster, even if it costs a few cents less. Drop-cords are worth saving, and short circuits may be troublesome.*

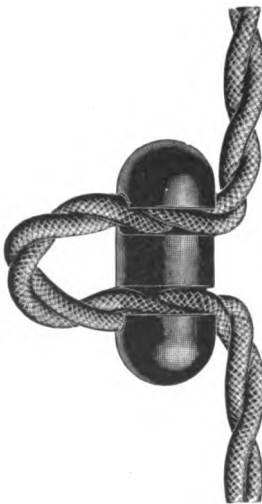
*Directions for Placing.*—Take one turn of the cord around the fingers of the left hand. Lay the two halves of the Adjuster on the cord, letting the cord lie in the grooves, as shown in the cut. Slip the spring ring over the end and down to its place.

No. 8914.....each, \$0.25



No. 8905.  
The Eddy Cord Adjuster.  
One Piece, Nickel-plated.

No. 8905.....each, \$0.05



No. 8915.  
Lamp Cord Adjuster.  
"Peanut."

" 8915....."

" 8925....."



No. 8925.  
Adjusting Ball.

The simplest device for hanging a lamp at any desired height. It can be put on in three seconds' time. Does not break or chafe the cord.

" 8915....."

" 8925....."

## FINISHING HANDLES.



No. 3620.



No. 3621.

No. 3620.	Hard Rubber.....	each, \$0.06
" 3621.	" " .....	" .06

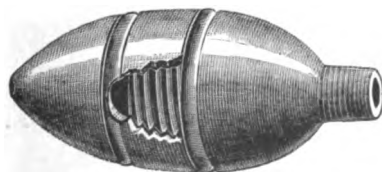
## SOCKET HANDLE.



The ends are reamed out to prevent bending the cord short and breaking it off.

No. 3623.	Black Enameled.....	each, \$0.04
-----------	---------------------	--------------

## SOCKET SAFETY ATTACHMENT.

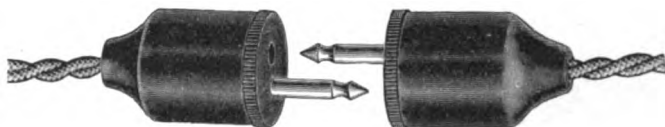


When properly attached to the socket the strain is removed from the cord terminals in the socket and the cord prevented from breaking off.

No. 3624.	Maple.....	each, \$0.07
" 3625.	Cherry .....	" .08

## WOOD'S FLEXIBLE CORD CONNECTOR.

DOUBLE POLE—DOUBLE BREAK.

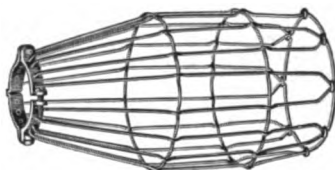


For Connecting Incandescent Lamp Cord.

The projecting ends are connected with the circuit only when the parts are slipped together: Therefore, the circuit can not be crossed, even should the ends be electrically connected. It is particularly useful where lights are wanted in such places as vaults, and other places where they can not remain continually connected.

No. 4187 ..... each, \$3.50

## WIRT LAMP GUARD.

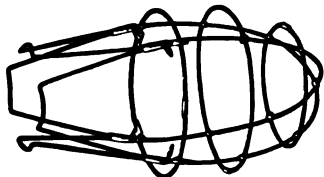


This is an extra-strong Guard, and what is equally important, it has a strong attachment device. Being open at the bottom, a lamp can be changed without removing the Guard.

*Fits any socket.* Easily attached. Can not work loose.

No. 3648 ..... each, \$0.35

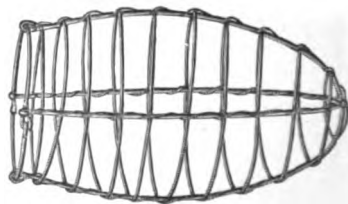
## EXPANSION WIRE GUARD.



This Guard requires no Shade Holder. To place or remove it, slide the sleeve up or down the ribs, which loosens or tightens them as required.

No. 3649 ..... each, \$0.25

## HEAVY WIRE GUARD.



Fits a  $3\frac{1}{4}$  inch Shade Holder.

No. 3650 ..... each, \$0.24

## THE CONOVER WATER-PROOF LAMP GLOBE.

For  $\frac{3}{8}$  inch Iron Pipe.



This Globe is designed for use both indoors and outdoors—wherever it is necessary to protect lamps efficiently from the weather or from damp and drip. It will be found very desirable for use in dye houses, breweries, packing houses, and other extremely wet or dirty places. While not intended primarily as a vapor-proof globe, it will be thoroughly effective as a protection against fire in places like flour mills, wood-working factories, varnish factories, and the like, where inflammable dust or powder is to be guarded against. Being very light, the globe may be suspended on wires where it is not desired to use a pipe. When so used, there should be a short pipe nipple screwed into the nozzle and this filled with some water-proof material in order to keep the interior perfectly dry. This device packs in a very small space and will be found economical as regards shipping expenses. The globe is easily removable when required for replacing a burned-out lamp or for cleaning, and being entirely protected from drip by the hood above, it will keep clean much better than the ordinary spherical shape.

No. 3863 ..... each, \$1.50

## VAPOR-PROOF GLOBE.

With Brass Screw Cap, complete, ready for use, without Socket.

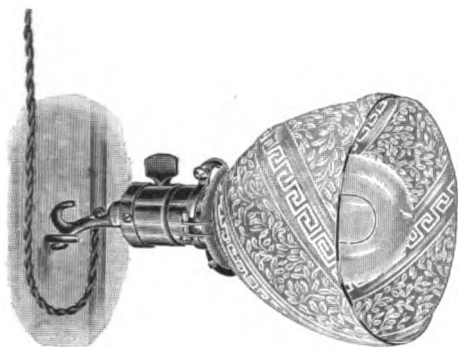
$\frac{3}{8}$  inch Iron Pipe.



No. 3861.	Diameter 6 in., height $8\frac{1}{2}$ inch.....	each, \$1.20
" 3861G.	Globe only .....	" .60
" 3861C.	Cap " .....	" .60

## SOCKET HOOK.

POLISHED BRASS.



Adjust screw-eye wherever lamp is needed. Lamp hangs vertically from large hook, or projects horizontally when small hook is used.

No. 2360. Complete with screw-eye.....each, \$0.30

## SOCKET HOOK.



Threaded to fit  $\frac{1}{4}$  inch socket.

No. 2359. Polished brass.....each, \$0.25

## WOOD'S UNIVERSAL DESK CLAMP.



Fig. 1.



Fig. 2.

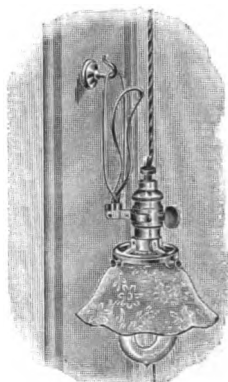


Fig. 3.



Fig. 4.

This is a simple device to meet the requirements of portable lighting.

Figure No. 1 shows the Clamp only.

Figure No. 2 shows the attachment, with lamp, as applied to a desk. When used in this way it is not necessary to have a separate lamp wired. A lamp, which hangs over the desk, can be easily drawn down and attached to the clamp, which is separate from the fixture. It is so arranged that it can be tilted in any direction to give the best results from the light. Can be used with or without a shade.

Figure No. 3 shows the Clamp as a wall bracket. When hung on the wall the lamp can be tilted up or down to throw the light in the desired direction.

Figure No. 4 shows the attachment with a half shade, as used on music racks, copy holders, etc. It not only affords adjustment of the lamp to get the best results, but can be so tilted as to shade the eyes.

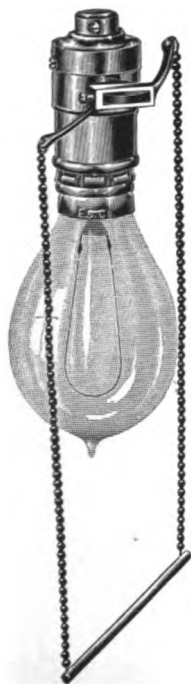
No. 3609. Nickel Plated ..... each, \$1.50

## WOOD'S LAMP ADJUSTER.



This attachment can be placed on all lamps suspended from drop cords, requiring no different arrangement in the wiring. There are many places where it is desired to hang the lamp at right angles to the suspended cord, as in that way considerably more light is received, the greatest amount of light coming from the sides of the lamp. The method of attachment for some of its uses is shown in the above illustrations. It will be found particularly useful over such places as billiard tables, desks, etc.

No. 3607. Nickel Plated.....each, \$0.40



## WOOD'S KEY SOCKET PENDANT.

This attachment is placed on the key of the socket, as shown in the cut, and used in turning on and off incandescent lamps where they are hung out of reach.

No. 3605. With Chain 9 inches long.....each, \$0.40  
 " 3605C. Extra Chains..... " .15

**E. S. SOCKETS.****EDISON SYSTEM.**

No. 3707. Key.....each, \$0.55

No. 3708. Keyless.....each, \$0.50

**E. S. SOCKETS.****THOMSON-HOUSTON SYSTEM.**

No. 3709. Key.....each, \$0.55

No. 3708. Keyless.....each, \$0.50

## E. S. SOCKETS.

### SAWYER-MAN (WESTINGHOUSE) SYSTEM.



No. 3711. Key.....each, \$0.55



No. 3710. Keyless.....each, \$0.50

## E. S. SOCKETS.

### NATIONAL SYSTEM.



No. 3585. Key.....each, \$0.65



No. 3586. Keyless.....each, \$0.55

## PUSH BUTTON SOCKET.

EDISON SYSTEM.



No. 3697 ..... each, \$0.50

## IMPROVED KEYLESS SOCKET.

EDISON SYSTEM.



No. 3698 ..... each, \$0.45

## WATER-PROOF SOCKETS.

EDISON SYSTEM.

Glass.



No. 3581 ..... each, \$0.55

Hard Rubber.



No. 3582 ..... each, \$0.55

## MOISTURE-PROOF SOCKET.

THOMSON-HOUSTON SYSTEM.



No. 3866.....each, \$1.00

## MOISTURE-PROOF SOCKET.

EDISON SYSTEM.



No. 3583.....each, \$1.00

## MOISTURE-PROOF SOCKET.

SAWYER-MAN SYSTEM.



No. 3867.....each, \$1.00

## THEATRE SOCKET.

EDISON SYSTEM.



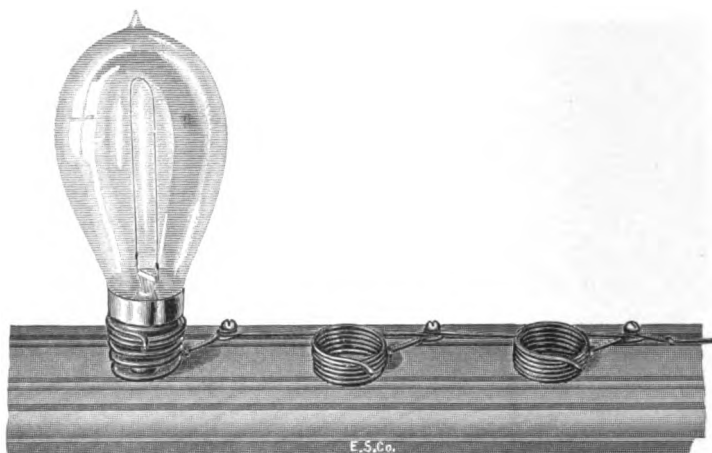
For Foot Lights, Etc.

No. 3580.....each, \$0.40

## TEMPORARY SOCKETS.

Patented Oct. 24, 1891.

For use in Illuminations, Decorative, and other Temporary Work—  
Indoors or Out.



This Socket, when used with the method of wiring for which it is designed, permits of very rapid placing and connection. The material is cheap, and the saving in labor makes the total cost a small fraction of what the same work could be done for by any other method. The system has been thoroughly tested and found entirely successful on the most difficult work. The cut shows clearly the method of placing and connecting. Full-size cuts are shown on the opposite page. Where rapid temporary work is required, screws can be dispensed with and nails used instead. By placing one line wire on the back of the strip, all danger of short circuit is avoided, and the arrangement has been found to stand a thorough wetting when used outdoors, without any trouble arising therefrom. A perfect connection is made without any danger of loosening from vibration, and although intended primarily for temporary work, these Sockets have been used successfully for work not temporary, and where a very cheap arrangement is desired it is thoroughly safe and effective.

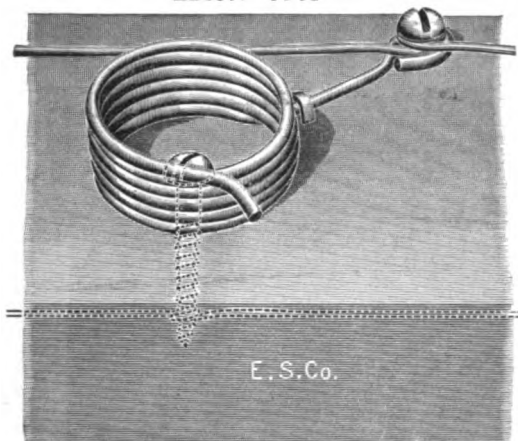
No. 3567.	To fit Edison Lamp.....	each, \$0.20
" 3568.	" " Thomson-Houston Lamp.....	" .20
" 3569.	" " Sawyer-Man Lamp.....	" .20

## TEMPORARY SOCKETS

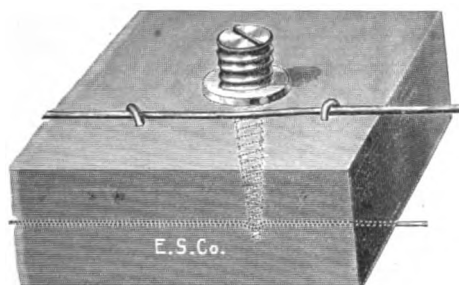
*Continued.*

**Cuts Full Size.**

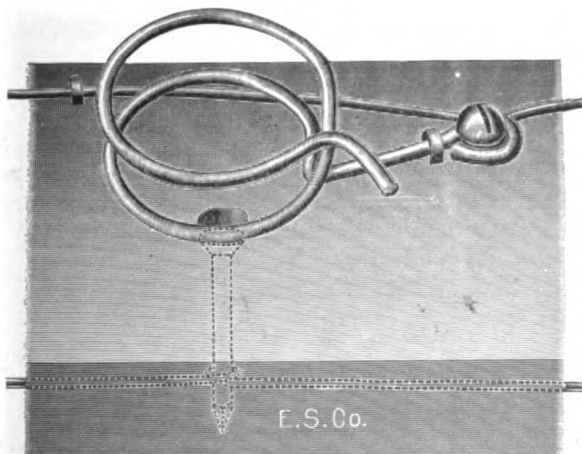
**EDISON SYSTEM.**



**THOMSON-HOUSTON SYSTEM.**



**SAWYER-MAN SYSTEM.**



**For prices, see opposite page.**

## E. S. WALL SOCKETS.

EDISON SYSTEM.



No. 3701. Key....each, \$0.60



No. 3700. Keyless...each, \$0.50

## E. S. WALL SOCKETS.

THOMSON-HOUSTON SYSTEM.



No. 3703. Key....each, \$0.60



No. 3702. Keyless...each, \$0.50

## E. S. WALL SOCKETS.

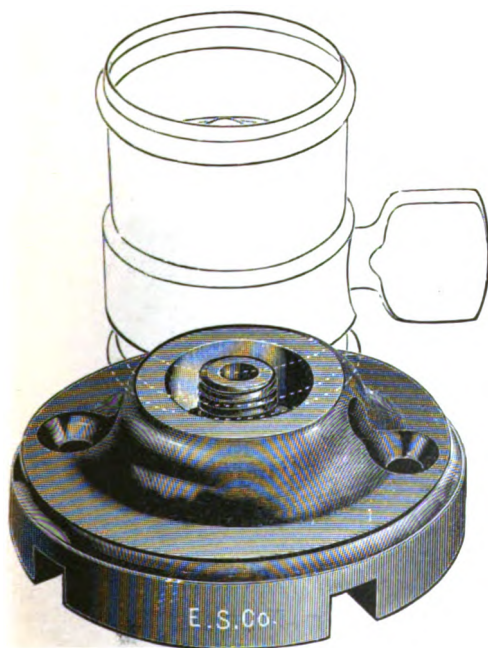
SAWYER-MAN (WESTINGHOUSE) SYSTEM.



No. 3705. Key.....each, \$0.60



No. 3704. Keyless.....each, \$0.50



## SOCKET BASE.

This Base is designed to hold any Socket with  $\frac{1}{8}$  inch flange by using a  $\frac{1}{8}$  inch hard rubber bushing. It is very convenient, enabling an ordinary Socket to be used as a receptacle Socket, and both supports and insulates the Socket in the most perfect manner.

No. 3595. Porcelain .....each, \$0.20  
 " 3595W. Wood ..... " .18

## FANCY RECEPTACLES.

EDISON SYSTEM.



No. 3688. Key..... each, \$0.65



No. 3689. Keyless..... each, \$0.45

## ATTACHMENT PLUGS.

For Attaching Flexible Cord to any Lamp Socket or Receptacle.

### EDISON SYSTEM.



No. 3593 .....each, \$0.38



No. 3594 .....each, \$0.35

### SAWYER-MAN SYSTEM.



No. 3592 .....each, \$0.35

### THOMSON-HOUSTON SYSTEM.



No. 3591 .....each, \$0.35

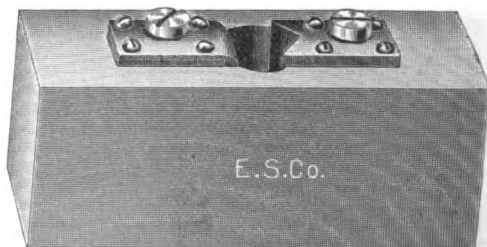


## MOISTURE-PROOF SOCKET PROTECTOR.

No. 3864. Complete.....each, \$1.00  
 " 3864R. Rubber neck only..... " .05

## THEATRE ATTACHMENT PLUG.

No. 3576. Receptacle only.....each, \$4.00  
 " 3577. Plug..... " 4.00



# RECEPTACLES AND ATTACHING PLUGS.

## EDISON SYSTEM.



No. 3587.



No. 3588.

No. 3587.	Wedge Receptacle for portable, 1 light.....	each, \$0.63
“ 3588.	“ Attaching Plug for same.....	“ .42



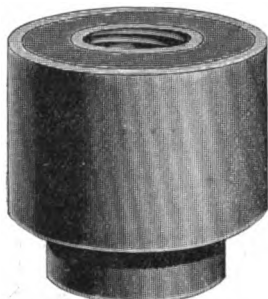
No. 3589.	Wedge Receptacle, 1 to 15 lights.....	each, \$2.50
“ 3590.	“ Attaching Plug for same.....	“ 1.25

## WIRT BRACKET INSULATING JOINT.

Patent Applied For.

For Combination or Electric Fixtures.

No Fibre.  
No Screws.  
No Soft Rubber.



This size has carried 3 500 lbs. without yielding.

Joints that will allow gas to escape are undesirable fixtures to have. *The Wirt Joint will not leak.* It is the simplest and best in the market. There are no loose parts or screws. It is strong and absolutely gas and "electric" tight. It will be in as perfect condition after years of service as the day it was put up.

No. 3910.	Size, $\frac{1}{4} \times \frac{3}{8}$	.....	each, \$0.55
" 3911.	" $\frac{3}{8} \times \frac{3}{8}$	.....	" .55

## WIRT CHANDELIER INSULATING JOINT.

Patent Applied For.



This size has carried 6,000 lbs. without yielding.



This is manufactured in the same manner as the Wirt Bracket Insulating Joint, being composed of two solid metallic portions, insulated and united by the best quality of hard rubber vulcanized in position. The Chandelier Joint is designed for longitudinal strength, and is the strongest joint in the market.

No. 3907.	Size, $\frac{1}{2} \times \frac{1}{2}$	.....	each, \$0.65
3908.	" $\frac{1}{2} \times \frac{3}{8}$	.....	" .65
" 3909.	" $\frac{3}{8} \times \frac{3}{8}$	.....	" .65

## INSULATING BALL JOINT.

For either Electric Light or Combination Fixtures.



No. 3327.	Smallest size,	$\frac{3}{8}$ in.	x	$\frac{1}{2}$ in.	.....	each, \$2.50
" 3328.	"	"	x	$\frac{3}{8}$ "	.....	" 2.50
" 3329.	"	"	x	$\frac{1}{2}$ "	.....	" 2.50
" 3330.	"	"	x	$\frac{3}{4}$ "	.....	" 2.50
" 3331.	Medium	"	x	$\frac{1}{2}$ "	.....	" 3.85
" 3332.	"	"	x	$\frac{3}{4}$ "	.....	" 3.85
" 3333.	"	"	x	$\frac{1}{2}$ "	.....	" 3.85
" 3334.	"	"	x	$\frac{3}{4}$ "	.....	" 3.85
" 3335.	Largest	" 1	x	$\frac{3}{4}$ "	.....	" 7.70
" 3336.	"	" 1	x	1 "	.....	" 7.70
" 3337.	"	" 1	x	1 $\frac{1}{2}$ "	.....	" 7.70

## CUP AND BALL INSULATING JOINT.

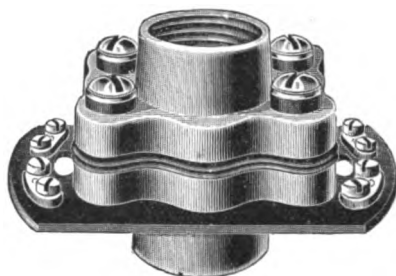
For Electric Light Fixtures only.



No. 3901.	$\frac{3}{8}$ in.	x	$\frac{1}{4}$ in.	.....	each, \$0.75
" 3902.	$\frac{3}{8}$ "	x	$\frac{3}{8}$ "	.....	" .75

## INSULATING JOINT AND CUT-OUT

COMBINED.



No. 3912. Brass, sizes  $\frac{3}{8}$  in. x  $\frac{1}{4}$  in. to  $\frac{3}{8}$  in. x  $\frac{3}{8}$  in. .... each, \$1.50

## IRON CROWFOOT.



No. 3784.	$2\frac{3}{4}$ inch spread,	tapped $\frac{1}{8}$ inch	.....	each, \$0.10
" 3762.	$2\frac{3}{4}$ "	" "	$\frac{1}{4}$ "	..... " .10
" 3764.	$2\frac{3}{4}$ "	" "	$\frac{3}{8}$ "	..... " .10
" 3785.	$2\frac{3}{4}$ "	" "	$\frac{1}{2}$ "	..... " .10

## IRON ELECTROLIER AND CHANDELIER BODIES.



No. 4225.	Two Light,	$\frac{1}{4}$ in. feed,	$\frac{1}{8}$ in. outlet	.....	each, \$0.15
" 4226.	" "	$\frac{1}{4}$ "	$\frac{1}{4}$ "	.....	" .21
" 4227.	Three "	$\frac{1}{4}$ "	$\frac{1}{8}$ "	.....	" .24
" 4228.	" "	$\frac{1}{4}$ "	$\frac{1}{4}$ "	.....	" .30
" 4229.	" "	$\frac{3}{8}$ "	$\frac{1}{8}$ "	.....	" .30
" 4230.	" "	$\frac{3}{8}$ "	$\frac{1}{4}$ "	.....	" .36
" 4231.	Four "	$\frac{1}{4}$ "	$\frac{1}{8}$ "	.....	" .30
" 4232.	" "	$\frac{1}{4}$ "	$\frac{1}{4}$ "	.....	" .36
" 4233.	" "	$\frac{3}{8}$ "	$\frac{1}{8}$ "	.....	" .36
" 4234.	" "	$\frac{3}{8}$ "	$\frac{1}{4}$ "	.....	" .42
" 4235.	Six "	$\frac{1}{4}$ "	$\frac{1}{4}$ "	.....	" .60

## CEILING PLATE FOR ELECTROLIERS.



No. 3783.	$\frac{3}{8}$ inch	.....	each, \$0.20
-----------	--------------------	-------	--------------

## WALL FLANGES.



**Polished Brass.**

No. 3765. Tapped for  $\frac{1}{8}$  and  $\frac{1}{4}$  inch iron pipe.....each, \$0.35



**Polished Brass.**

No. 3766. Tapped for  $\frac{1}{8}$ ,  $\frac{1}{4}$  and  $\frac{3}{8}$  inch iron pipe.....each, \$0.50



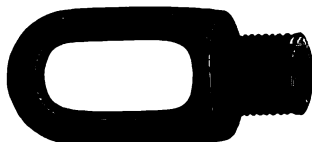
**Bronzed Iron.**

No. 3767. Tapped for  $\frac{1}{8}$  and  $\frac{1}{4}$  inch iron pipe.....each, \$0.14

**ELECTROLIER HOOK.**

For suspending electroliers, used in connection with electrolier loop.

No. 3631.	For $\frac{1}{4}$ inch pipe	.....	each, \$0.20
" 3632.	" $\frac{3}{8}$ "	.....	" .20
" 3633.	" $\frac{1}{2}$ "	.....	" .20

**ELECTROLIER LOOP.**

No. 3629	.....	each, \$0.20
----------	-------	--------------

**STRAIGHT NOZZLE.**

POLISHED BRASS.



No. 3097.	$\frac{1}{8}$ x $\frac{1}{8}$ inch, Iron Thread	.....	each, \$0.25
" 3098.	$\frac{1}{8}$ x $\frac{1}{4}$ " " "	.....	" .25
" 3099.	$\frac{1}{8}$ x $\frac{3}{8}$ " " "	.....	" .25

**ELBOW NOZZLE.**

POLISHED BRASS.



No. 3094.	$\frac{1}{8}$ x $\frac{1}{8}$ inch, Iron Thread	.....	each, \$0.25
" 3095.	$\frac{1}{8}$ x $\frac{1}{4}$ " " "	.....	" .25
" 3096.	$\frac{1}{8}$ x $\frac{3}{8}$ " " "	.....	" .25

## THE E. S. CLUSTER.

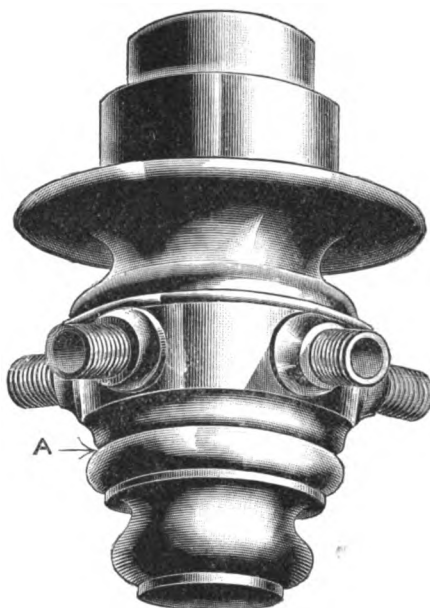


Fig. 1.

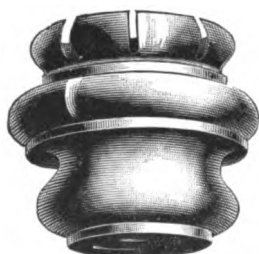


Fig. 2.

Fig. 1 represents the Cluster as made of polished brass. Fig. 2, the base of Cluster, which is made detachable, thus permitting of wiring in a very few moments, as well as inspecting at any time.

The Cluster is arranged to take a shade which does away with holders and at the same time diffuses the light perfectly.

No. 3400.	3-Light	.....	each, \$3.00
" 3401.	4 "	.....	" 3.50
" 3402.	5 "	.....	" 3.75

## CLUSTER BALL.



Tapped any Size.

No. 3394.	2-Light	.....	each, \$ .75
" 3395.	3 "	.....	" 1.00
" 3396.	4 "	.....	" 1.25
" 3397.	5 "	.....	" 1.70
" 3398.	6 "	.....	" 2.50

## SEPARABLE BOX CLUSTER.

TAPPED ANY SIZE.



No. 3362.	Polished brass,	3-light	.....	each, \$	3.25
" 3363.	"	4 "	.....	"	3.50
" 3364.	"	6 "	.....	"	3.75
" 3365.	"	8 "	.....	"	5.00
" 3366.	"	10 "	.....	"	7.00
" 3367.	"	12 "	.....	"	10.00
" 3368.	"	15 "	.....	"	12.00

## BOX CLUSTER.

Stem tapped for  $\frac{3}{8}$ -inch iron pipe. Removable Shell for wiring.

No. 3387.	4-light	.....	each, \$	3.75
" 3388.	6 "	.....	"	4.00
" 3389.	8 "	.....	"	5.50
" 3390.	10 "	.....	"	7.50
" 3391.	12 "	.....	"	10.00
" 3392.	15 "	.....	"	15.00

**SLIDING CANOPIES.**

POLISHED BRASS OR BRONZE.

**Spun Slides.**

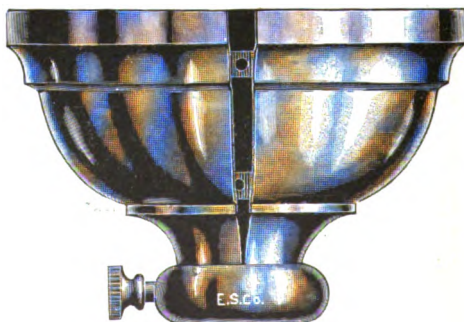
No. 3768.	4 in. diameter,	2½ in. deep,	for ¾ in. tubing	.....	each, \$0.70
" 3769.	4 " "	2¾ " "	" ¾ " "	.....	" .85
" 3770.	4 " "	3¼ " "	" ¾ " "	.....	" 1.00

**Cast Slides.**

No. 3780.	4 in. diameter,	2 in. deep,	for ¾ in. tubing	.....	each, \$0.90
" 3781.	4½ " "	2½ " "	" ¾ " "	.....	" 1.05
" 3782.	5 " "	3 " "	" 1 " "	.....	" 1.30

**SLIDING SPLIT CANOPIES.**

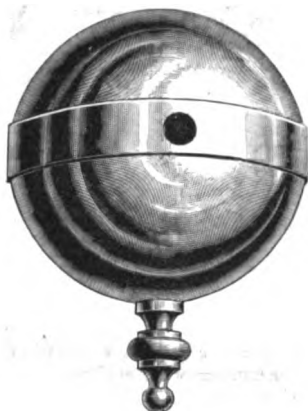
POLISHED BRASS OR BRONZE.



No. 3771.	4½ in. diameter,	2½ in. deep,	for ¾ in. tubing	.....	each, \$1.65
" 3772.	5 " "	3 " "	" 1 " "	.....	" 1.90

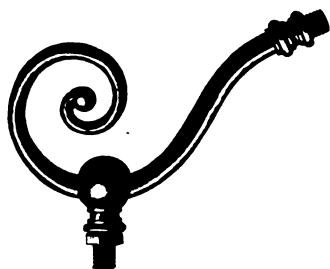
## ELECTROLIER OR CLUSTER BODY.

For Attaching Arms or Nipples for Incandescent Lamps.



No. 3790.	Diameter of body,	2½ inches	.....	each, \$1.95
" 3791.	"	3 "	.....	" 2.10
" 3792.	"	3½ "	.....	" 2.25
" 3793.	"	4 "	.....	" 2.40

In ordering please state number of lights required.



## ELECTROLIER ARMS.

For Attaching Incandescent Lamps to Gas Fixtures or Electroliers.

No. 3741.	4 in. spread,	¾ in. tubing,	each, \$1.65
" 3742.	5 "	" ¾ "	" 1.80
" 3744.	7 "	" 1 ¼ "	" 2.10
" 3748.	10 "	" 1 ½ "	" 2.70

Polished and lacquered. Price includes nipple and nut on back.



## COMBINATION STOP-COCKS.

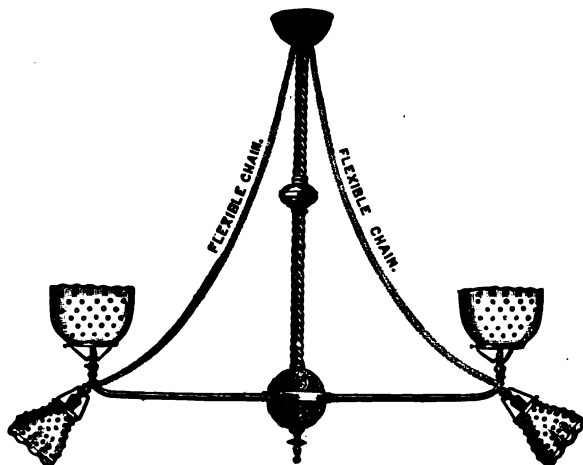
Polished Brass or Bronze.

No. 3763.	For ¼ inch iron pipe slip, ⅜ inch casing	.....	each, \$3.50
-----------	--	-------	--------------

If extra nipples are required, add to list for each, .60

## MCCREARY FLEXIBLE BRASS CHAIN.

Patented.



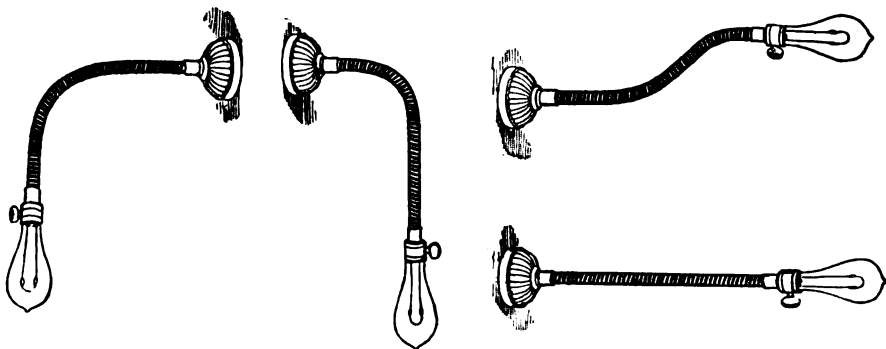
Actual Size of Chain.

This Chain will be found useful in wiring gas chandeliers for electric lights. Through it the flexible cord is carried direct from the ceiling or canopy to the lamp. The Chain will cover No. 16 B. & S. Duplex Cord. It is made in lengths of 25 feet, is easily separated or spliced, and can be readily attached.

No. 3199.	Brass .....	per foot, \$0.30
" 3199 N.	Nickel Plated .....	" .50

## ALMOND'S FLEXIBLE TUBE BRACKETS.

Patented.



Trade No. 3201.

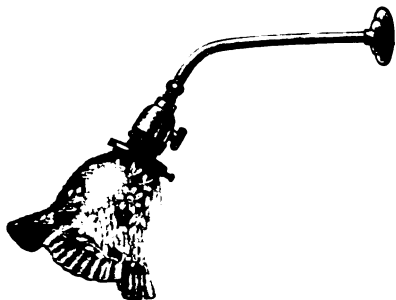
Can be bent in any shape desired, and when bent remains in position. Especially valuable in hospitals, laboratories, dental and surgical work, in art galleries, over work tables, and in all places where it is desired to change the position of the lamp for any purpose.

6 inch Electrical Bracket .....	each, \$1.50
9 " " " .....	" 1.75
12 " " " .....	" 2.00
15 " " " .....	" 2.25
18 " " " .....	" 2.50

All mounted with brass connections, with  $\frac{1}{8}$ -inch thread, fitting any socket.

## ELECTRIC LIGHT BRACKETS.

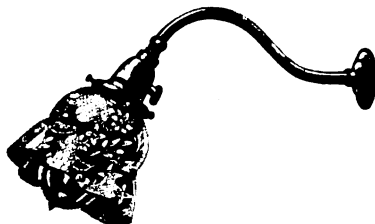
Prices do not include Lamps, Sockets, or Shades.



No. 3739.

 $\frac{3}{8}$  inch Tube.

6 in., per doz.	\$10.00
8 " "	10.75
10 " "	11.50
12 " "	12.00



No. 3740.

 $\frac{3}{8}$  inch Tube.

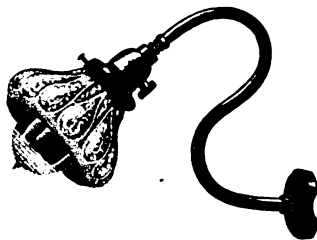
6 in., per doz.	\$10.00
8 " "	10.75
10 " "	11.50
12 " "	12.00



No. 3745.

 $\frac{3}{8}$  inch Tube.

6 in., per doz.	\$10.00
8 " "	10.75
10 " "	11.50
12 " "	12.00



No. 3720.

 $\frac{7}{8}$  inch Tube.

Extends 8 in. each, \$1.75



No. 3747.

 $\frac{3}{8}$  inch Tube.

6 in., per doz.	\$12.50
8 " "	13.25
10 " "	13.75
12 " "	14.25



No. 3746.

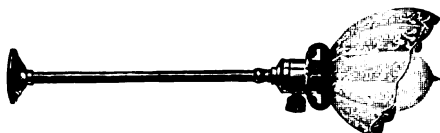
 $\frac{3}{8}$  inch Tube.

6 in., per doz.	\$15.00
8 " "	15.75
10 " "	16.25
12 " "	17.00

## ELECTRIC LIGHT BRACKETS

*Continued.*

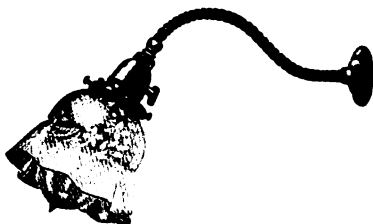
Prices do not Include Lamps, Sockets, or Shades.



No. 3743.

 $\frac{3}{8}$  inch Tube.

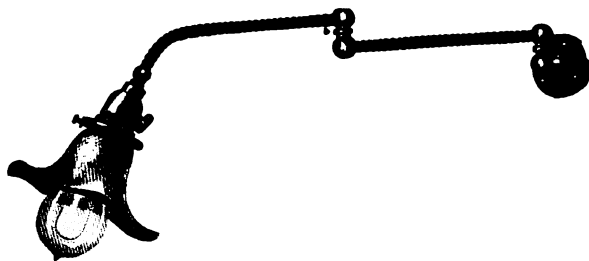
6 inch, per doz.	\$ 9.00
8 " " "	10.00
10 " " "	11.00
12 " " "	12.00



No. 3735.

 $\frac{3}{8}$  inch Tube.

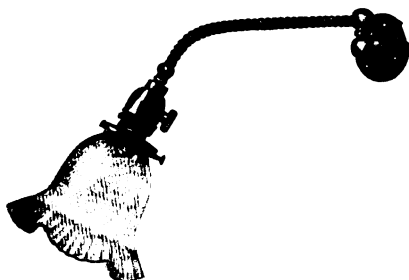
6 inch, per doz.	\$16.00
8 " " "	17.00
10 " " "	18.00
12 " " "	19.00



No. 3717.

 $\frac{3}{8}$  inch Tube.

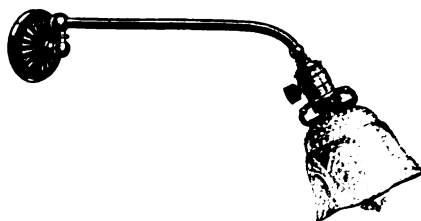
Spread, 24 inch ..... each, \$5.50



No. 3723.

 $\frac{3}{8}$  inch Tube.

Spread, 12 inch ..... each, \$3.75



No. 3203.

 $\frac{3}{8}$  inch Tube.

Spread, 12 inch ..... each, \$2.75

## ELECTRIC LIGHT BRACKETS

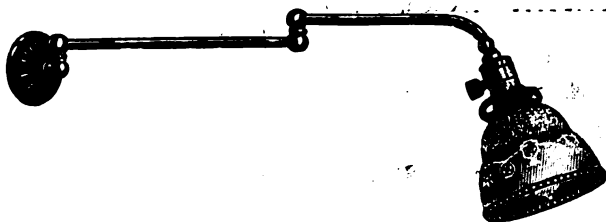
*Continued.*

Prices do not Include Lamps, Sockets, or Shades.



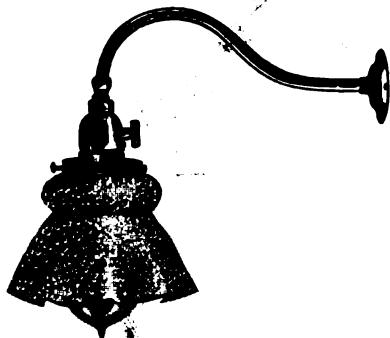
No. 3731.  
 $\frac{1}{8}$  inch Tube.

12 inch ..... each, \$1.70



No. 3204.  
 $\frac{1}{8}$  inch Tube.

Spread, 24 inch ..... each, \$4.00



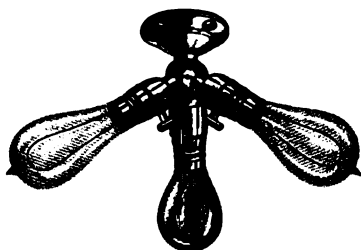
No. 3732.  
 $\frac{1}{8}$  inch Tube.

4 inch	.....	each, \$ .90
6 "	.....	" .95
8 "	.....	" 1.00
10 "	.....	" 1.05
12 "	.....	" 1.10

## ELECTRIC LIGHT BRACKETS

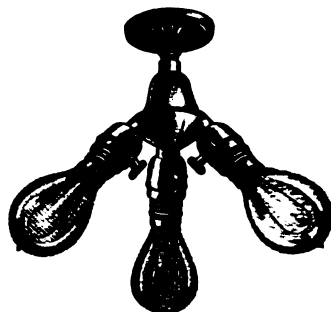
*Continued.*

Prices do not include Lamps or Sockets.

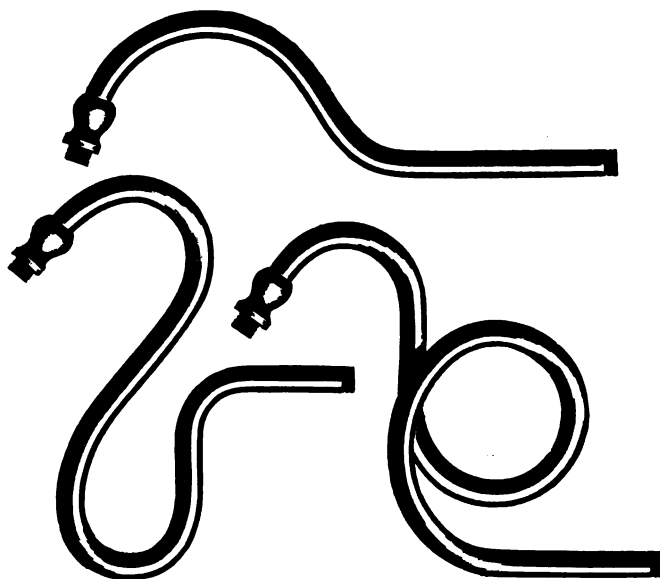


No. 3718.

3-Light.....each, \$1.50



No. 3719.

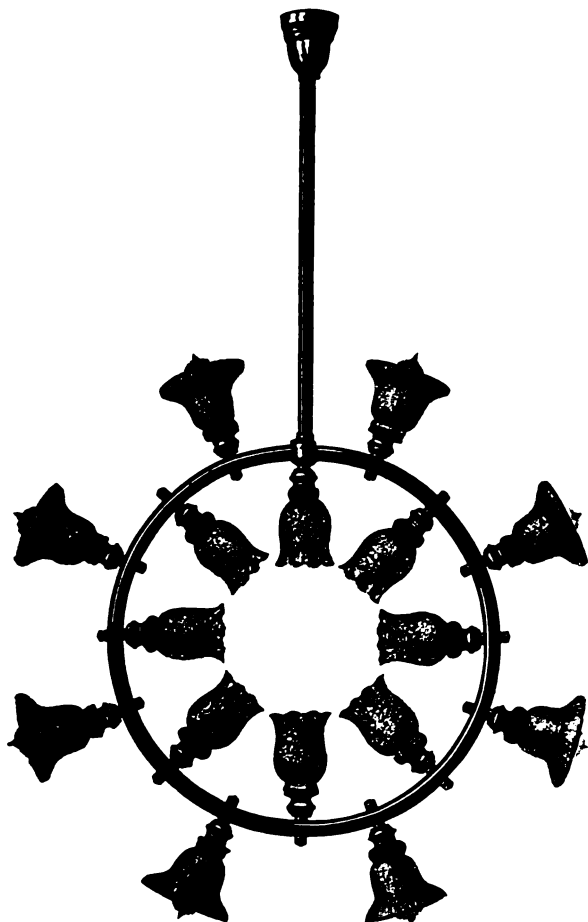
 3-Light.....each, \$3.00  
 4 " ..... " 3.50


No. 3206.	Plain, 8 inches.....	each, \$ .70
" 3206½.	" 10 " .....	" .75
" 3207.	Swan.....	" 1.00
" 3208.	Snake .....	" 1.00

## PENDANTS.

No. 3749. Pendant only (without cluster and reflector).....each, \$ 5.00

No. 3749C. Pendant with 4-light cluster and 12-inch mirror reflector (without lamps)  
.....each, 10.50



No. 3716.....each, \$60.00

Price does not include lamps, sockets, or shades.



## RING PENDANT.

Made to order only. We can furnish this Pendant either in polished brass or nickel-plated finish. We can furnish them in any design or special letters as may be desired for show-window illumination.

## ELECTRIC LIGHT FIXTURE.

For Electric Light Only.



No. 3722.

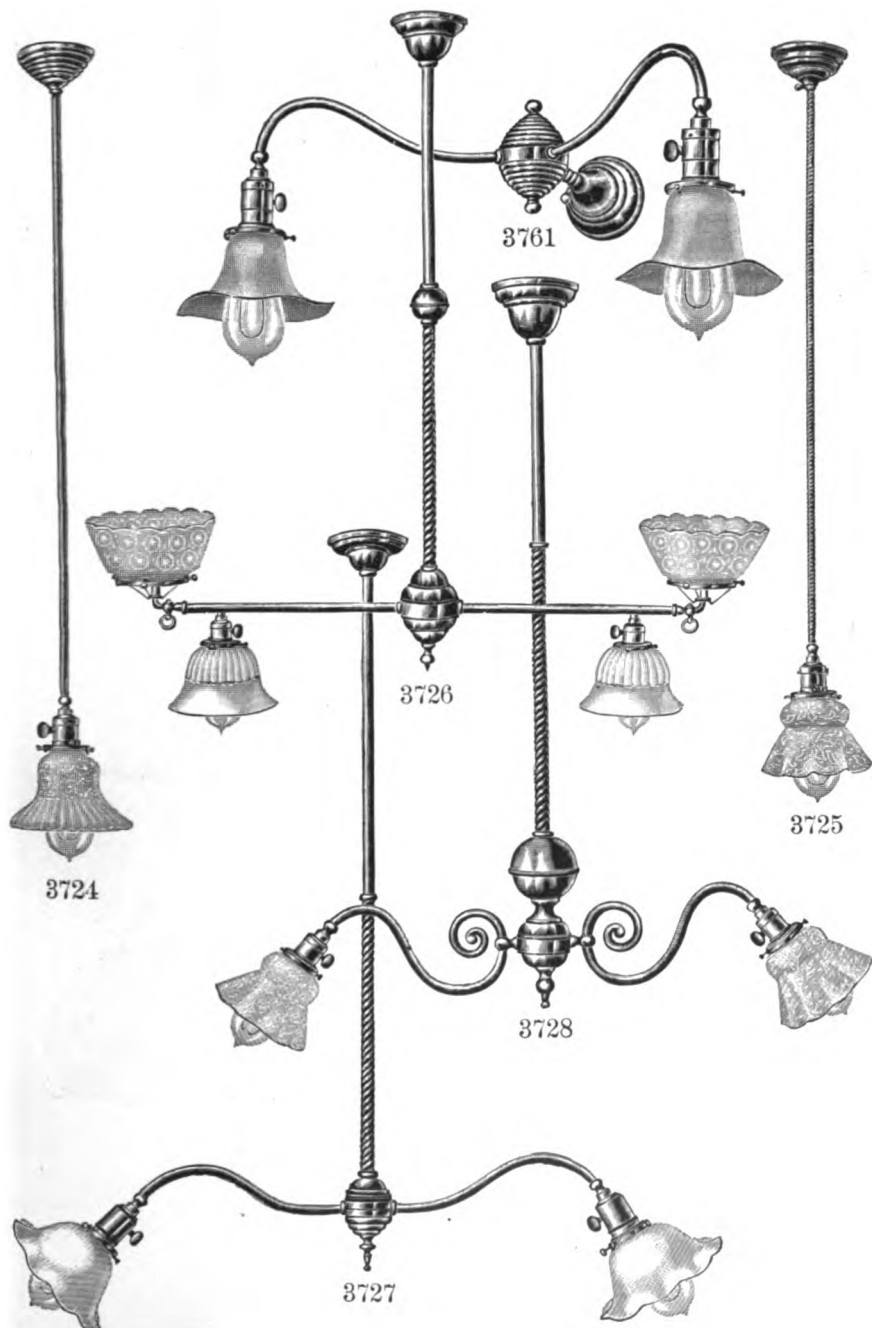
Finished in Polished Brass or Gold.

Length, 40 inches ; Spread, 30 inches.

2-Light, Electric	.....	each, \$15.00
3 " "	.....	" 20.00
4 " "	.....	" 25.00

Fixtures have insulated joints and are wired. Prices do not include lamps, sockets, or shades.

# ELECTRIC LIGHT FIXTURES.



For prices, see page 245.

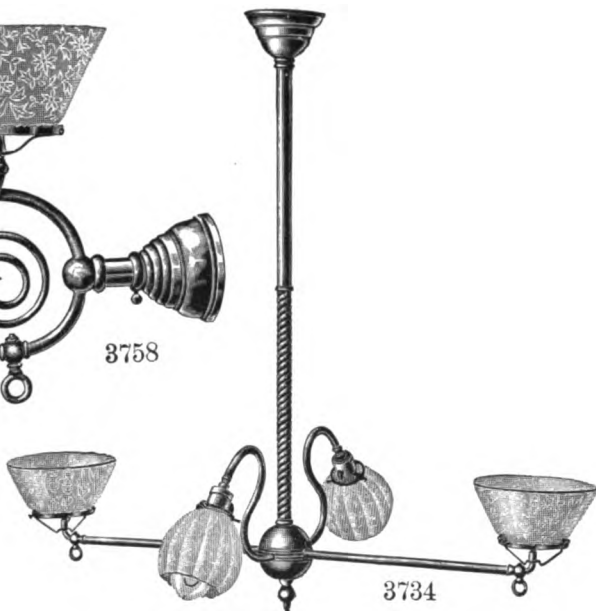
ELECTRIC LIGHT FIXTURES—*Continued.*

For prices, see page 245.

ELECTRIC LIGHT FIXTURES—*Continued.*



3758



3734



3759



3760



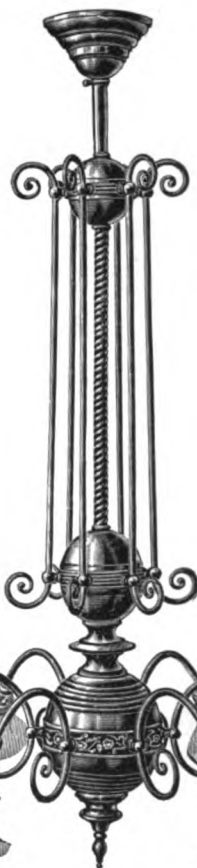
3733

For prices, see page 245.

## ELECTRIC LIGHT FIXTURES

*Continued.*

3721.



3730.



3729.

For prices, see page 245.

ELECTRIC LIGHT FIXTURES—*Continued.*

## PRICES.

The following Electroliers, Combination Fixtures, and Brackets are finished in polished brass. We can furnish them promptly finished in Turkish copper, oxidized silver, or nickel-plated, for which we will make a small additional charge. The lengths given are from the base of the canopy to the lowest part of the fixture; the spread is from nozzle to nozzle. If extra lengths or extra spreads are desired, additional charges will be made according to the changes. These prices do not include lamps, sockets, or shades, nor do they include fixtures wired. Where ordered, we will so furnish them, charging extra for the wiring.

## Illustrated on page 241.

No. 3724.	Electric Drop, length 28 in., $\frac{3}{8}$ in. plain tube.....	each, \$2.00
"	" " " 40 " $\frac{1}{8}$ " " " .....	" 3.75
" 3725.	Electric Drop, length 36 in., $\frac{3}{8}$ in. rope tube .....	" 3.75
The above Drops are especially adapted for two, three, and four-light cluster balls.		
" 3761.	2-Light Electric Bracket, spread 16 in. ....	each, 6.00
"	3 " " " 16 " .....	" 8.25
" 3726.	2-Light Combination, length 40 in., electric spread 22 in., gas spread 28 in. ....	" 12.00
"	3-Light Combination, length 40 in., electric spread 22 in., gas spread 28 in. ....	" 15.00
"	4-Light Combination, length 40 in., electric spread 22 in., gas spread 28 in. ....	" 17.00
" 3728.	2-Light Electrolier, length 40 in., spread 20 in. ....	" 13.00
"	3 " " " 40 " " 20 " .....	" 18.00
"	4 " " " 40 " " 20 " .....	" 23.00
" 3727.	2-Light Electrolier, length 40 in., spread 18 in. ....	" 8.00
"	3 " " " 40 " " 18 " .....	" 10.00
"	4 " " " 40 " " 18 " .....	" 12.00

## Illustrated on page 242.

No. 3737.	Combination Drop, length 36 in. ....	each, \$ 9.00
" 3738.	2-Light Electrolier, length 40 in., spread 16 in. ....	" 9.00
"	3 " " " 40 " " 16 " .....	" 11.00
"	4 " " " 40 " " 16 " .....	" 13.00
" 3757.	Combination Bracket, extends 15 in. from base to nozzle	" 7.50
" 3756.	Combination Pendant, length 40 in. ....	" 9.00

## Illustrated on page 243.

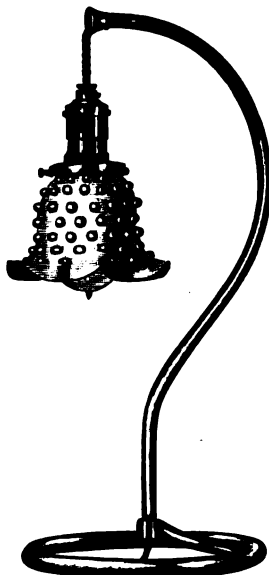
No. 3758.	Combination Bracket, extends 13 in. from base to nozzle each,	\$ 9.00
" 3734.	Combination, length 40 in., electric spread 16 in., gas spread 24 in. ....	" 16.00
" 3759.	Electric Bracket, extends 10 in. from base to nozzle...	" 3.40
" 3760.	" " " 13 " " " " .....	" 3.50
" 3733.	2-Light Electrolier, length 40 in., spread 18 in. ....	" 8.00
"	3 " " " 40 " " 18 " .....	" 10.00
"	4 " " " 40 " " 18 " .....	" 12.00

## Illustrated on page 244.

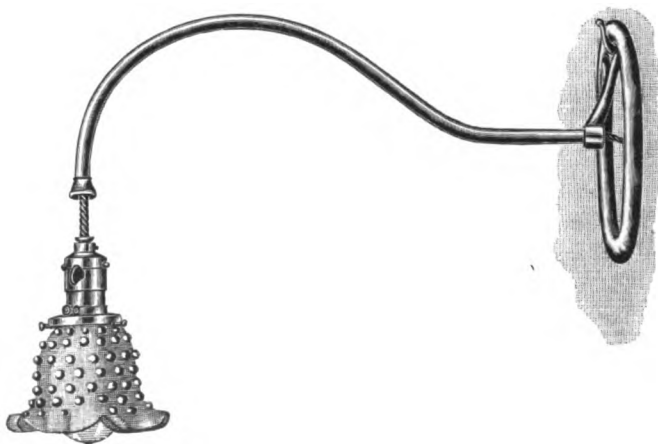
No. 3721.	3-Light Car Electrolier, length 10 in. ....	each, \$ 8.00
" 3730.	2-Light Electrolier, length 42 in., spread 27 in. ....	" 25.00
"	3 " " " 42 " " 27 " .....	" 34.00
"	4 " " " 42 " " 27 " .....	" 43.00
"	5 " " " 42 " " 27 " .....	" 52.00
"	6 " " " 42 " " 27 " .....	" 61.00
" 3729.	2-Light Combination Chandelier, length 42 in., electric spread 25 in., gas spread 26 in. ....	" 22.00
"	3-Light Combination Chandelier, length 42 in., electric spread 25 in., gas spread 26 in. ....	" 28.00
"	4-Light Combination Chandelier, length 42 in., electric spread 25 in., gas spread 26 in. ....	" 34.00

# BASSETT COMBINATION PORTABLE AND BRACKET.

Patented.



Portable.

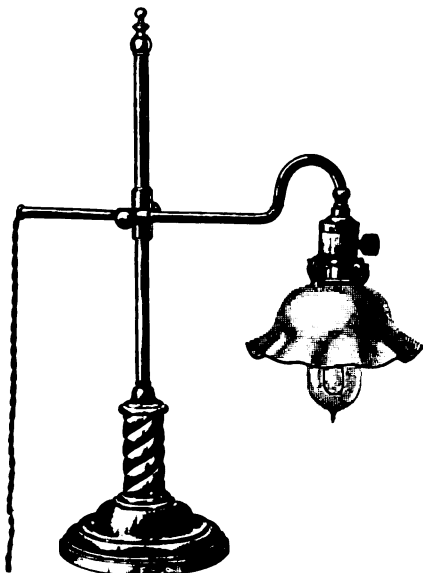


Bracket.

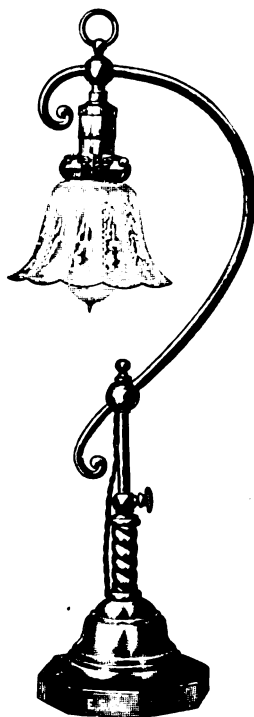
No. 3752. Height 20 inches.....each, \$4.00

The above price is for Bracket only, and does not include shade, lamp, or socket.

## DESK PORTABLES.



No. 3755. Height 23 inches, with 6 inch extension ..... each, \$10.00

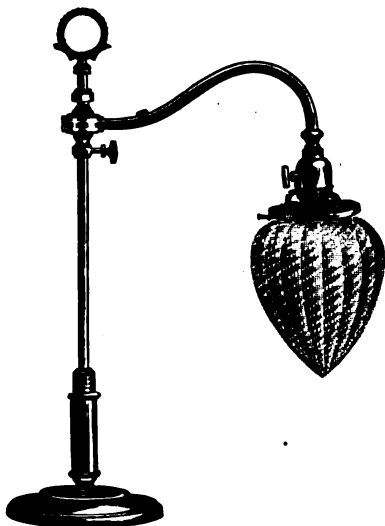


No. 3753. Height 20 inches ..... each, \$9.00

The above prices are for Portables only, and do not include shades, lamps, or sockets.

**DESK PORTABLES.****POLISHED BRASS.**

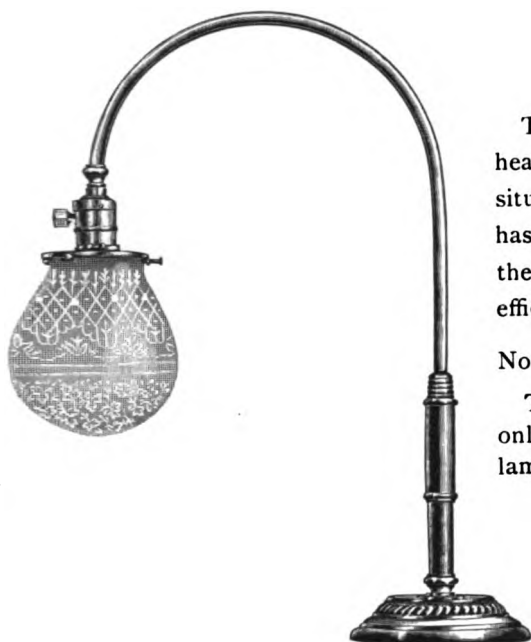
No. 3751. Height, 23 inches.....each, \$6.00



No. 3754. Height, 19 inches.....each, \$8.00

The above prices are for Portables only, and do not include shades, lamps, or sockets.

## DESK AND PIANO PORTABLE LAMP.



This Portable has a long reach and heavy base, and is designed for those situations where the ordinary stand has not sufficient projection to bring the light in the proper position for efficient illumination.

No. 3750.....each, \$6.00

The above price is for Portable only, and does not include shade, lamp, or socket.

## DESK PORTABLE.

**COMPLETE.**

No. 3751 C. Furnished complete, ready for use, including Portable, key socket, shade holder, 7-inch McCreary shade, with sufficient incandescent cord.....each, \$9.00



## INCANDESCENT SHADES.



3801.



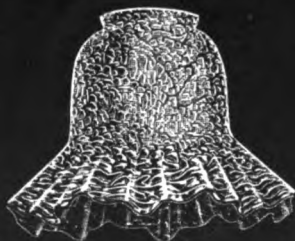
3802.



3803.



3804.



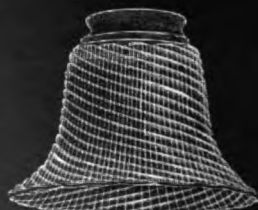
3841.



3806.



3842.



3843.

For prices, see page 255.

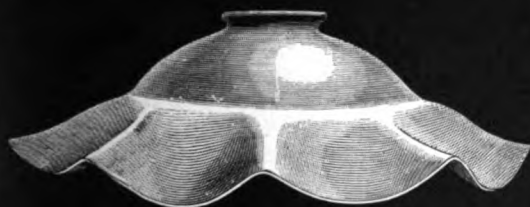
INCANDESCENT SHADES—*Continued.*



3809.



3844.



3811.



3812.



3813.



3814.

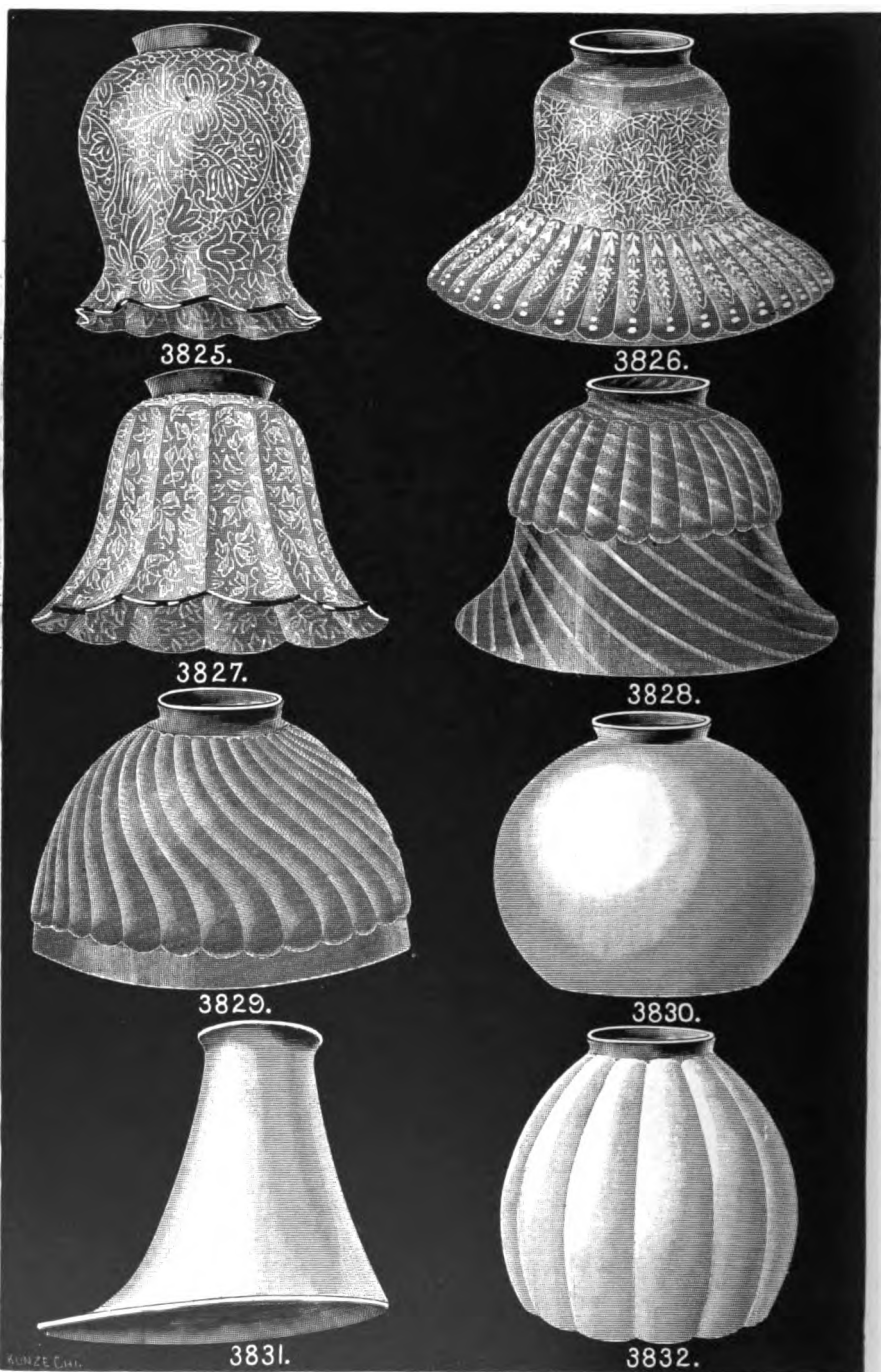


3815.



3845.

For prices, see page 255.

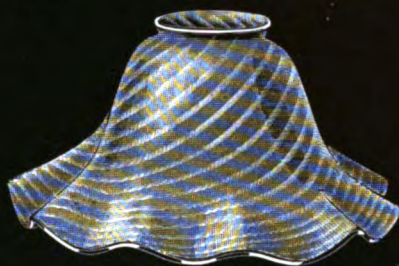
INCANDESCENT SHADES—*Continued.*

For prices, see page 255.

INCANDESCENT SHADES—*Continued.*



3817.



3818.



3819.



3820.



3821.



3822.



3823.



3824.

For prices, see page 256.

INCANDESCENT SHADES—*Continued.*

3833.



3834.



3835



3836



3837.



3838.



3839.



3840.

For prices, see page 256.

# INCANDESCENT SHADES

*Continued.*

## PRICES.

*Illustrated on page 250.*

No. 3801.	Fluted, $3\frac{3}{4}$ in. high, 7 in. diameter, $2\frac{1}{4}$ in. holder, Crystal, each,	\$1.35
" 3802.	Etched, $4\frac{1}{2}$ in. high, $4\frac{1}{2}$ in. diameter, $2\frac{1}{4}$ in. holder, Crystal, assorted tinted edges.....	" 1.65
	All Crystal.....	" 1.35
" 3803.	Etched, 4 in. high, 5 in. diameter, $2\frac{1}{4}$ in. holder, Crystal	" .65
" 3804.	Etched, 4 in. high, $6\frac{1}{2}$ in. diameter, $2\frac{1}{4}$ in. holder, Crystal	" .75
" 3841.	6 in. diameter, $2\frac{1}{4}$ in. holder, Rock Crystal.....	" 1.25
" 3806.	Wart, 4 in. high, $5\frac{1}{2}$ in. diameter, $2\frac{1}{4}$ in. holder, assorted tinted edges.....	" 1.35
" 3842.	5 in. diameter, $2\frac{1}{4}$ in. holder, Reflector Glass Shade....	" .35
" 3843.	5 in. diameter, $2\frac{1}{4}$ in. holder, Reflector Glass Shade....	" .35

*Illustrated on page 251.*

No. 3809.	Spot, $4\frac{1}{2}$ in. high, 6 in. diameter, $2\frac{1}{4}$ in. holder, Ruby...each,	\$1.35
	Flint Opalescent and Light Blue.....	" .85
" 3844.	Etched, $2\frac{1}{4}$ in. holder, Crystal.....	" .75
" 3811.	Opal, $3\frac{1}{2}$ in. high, $2\frac{1}{4}$ or $3\frac{1}{2}$ in. holder,	
	Diameter, inches.....	5 6 7 8 10
	Price.....each,	\$0.24 .26 .27 .31 .42
" 3812.	Etched, $4\frac{1}{2}$ in. high, $5\frac{1}{2}$ in. diameter, $2\frac{1}{4}$ in. holder, Crystal.....	" .65
" 3813.	Fluted, Opal, $2\frac{1}{4}$ in. holder,	
	Diameter, inches.....	5 6 7 8 10
	Price.....each,	\$0.26 .26 .30 .35 .52
" 3814.	Opal, $1\frac{1}{2}$ in. high, $2\frac{1}{4}$ or $3\frac{1}{2}$ in. holder,	
	Diameter, inches.....	6 7 8 10 12 14
	Price.....each,	\$0.24 .26 .27 .29 .54 .60
" 3815.	Fluted, Opal, $2\frac{1}{4}$ or $3\frac{1}{2}$ in. holder,	
	Diameter, inches.....	6 7 8 10 12 14
	Price.....each,	\$0.27 .28 .31 .42 .60 .78
" 3845.	Etched, $3\frac{1}{2}$ in. holder, Crystal.....	" .65

*Illustrated on page 252.*

No. 3825.	Etched, $4\frac{3}{4}$ in. high, 4 in. diameter, $2\frac{1}{4}$ in. holder, Crystal.....	each, \$ .85
" 3826.	Etched, $2\frac{1}{4}$ in. holder.....	" 1.35
" 3827.	Etched, $4\frac{1}{2}$ in. high, 6 in. diameter, $2\frac{1}{4}$ in. holder, Crystal.....	" 1.55
" 3828.	Twist, 4 in. high, $6\frac{1}{2}$ in. diameter, $2\frac{1}{4}$ in. holder, Flint Opalescent.....	" .45
" 3829.	$2\frac{1}{4}$ in. holder, Sand Blast Inside.....	" .65
" 3830.	Opal, 4 in. high, 5 in. diameter, $2\frac{1}{4}$ in. holder.....	" .26
" 3831.	$2\frac{1}{4}$ in. holder, assorted tints.....	" 1.75
" 3832.	Melon, Opal, 5 in. high, $4\frac{1}{2}$ in. diameter, $2\frac{1}{4}$ in. holder..	" .26

# INCANDESCENT SHADES

*Continued.*

## PRICES.

Illustrated on page 253.

No. 3817.	4 in. high, 6 in. diameter, 2½ in. holder, Flint Opalescent, assorted tinted edges.....	each, \$1.35
	Opalescent, not tinted edges.....	“ .35
“ 3818.	Twist, 3½ in. high, 2½ in. holder,	
	Diameter, inches.....	6 7 8 10
	Flint Opalescent.....	each, \$0.55 .60 .65 .75
“ 3819.	Etched, 4 in. high, 6 in. diameter, 2½ in. holder, Crystal,	“ .85
“ 3820.	Etched, 3½ in. high, 5 in. diameter, 2½ in. holder, Crystal.....	“ 1.75
“ 3821.	Twist, 4½ in. high, 5½ in. diameter, 2½ in. holder, Ruby.....	“ 1.00
	Flint Opalescent, Light Blue Opalescent, or Amber....	“ .55
“ 3822.	Etched, 4½ in. high, 6 in. diameter, 2½ in. holder, Crystal, assorted tinted edges.....	“ 1.55
	All Crystal.....	“ 1.10
“ 3823.	Twist, 6½ in. high, 5½ in. diameter, 3½ in. holder, Ruby.....	“ 1.45
	Flint Opalescent.....	“ .75
	Crystal.....	“ .65
“ 3824.	Heavy Straight Rib, 8½ in. high, 5½ in. diameter, Crystal.....	“ 1.35

Illustrated on page 254.

No. 3833.	Etched, 4 in. high, 5 in. diameter, 2½ in. holder, Crystal.....	each, \$ .65
“ 3834.	5 in. diameter, 2½ in. holder, First Empire Design.....	“ .65
“ 3835.	Etched, 5 in. diameter, 2½ in. holder, Crystal.....	“ .40
“ 3836.	Etched, 3½ in. high, 4½ in. diameter, 2½ in. holder, Crystal.....	“ .55
“ 3837.	4½ in. diameter, 2½ in. holder, First Empire Design.....	“ .35
“ 3838.	Cut and Etched, 6½ in. high, 5 in. diameter, 3½ in. holder, Stalactite.....	“ 1.35
“ 3839.	8 in. high, 4½ in. diameter, 3½ in. holder, Flame.....	“ 1.85
“ 3840.	Round Electric Ball, 4 in. holder,	
	Diameter, inches.....	6 7 8 9 10 12 14
	Flint Opalescent, each, \$1.00	1.15 1.50 1.75 2.25 2.75 3.55
	Crystal.....	“ .85 1.00 1.35 1.55 1.85 2.45 3.35

**TIN SHADES.****FLAT CONE.**

Green Outside, Glossy Enamel White Inside. 2½ Inch Shade-Holder.



No. 3877.

8 inch	.....	each, \$0.40	12 inch	.....	each, \$0.65
10 "	.....	" .50	14 "	.....	" .85

**MEDIUM CONE.**

No. 3873.

8 inch	.....	each, \$ .70
10 "	.....	" .80
12 "	.....	" 1.00

**DEEP CONE.**

No. 3890.

5 inch diameter by 7 inches high	.....	each, \$1.00
7 " " " 7½ " "	.....	" 1.20

**CONVEX.**

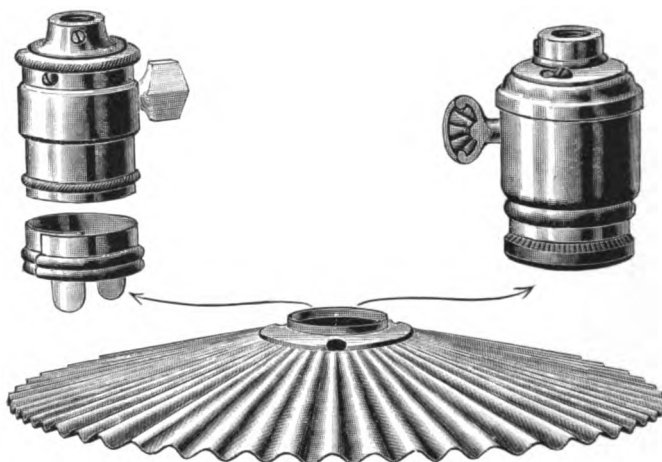
No. 3870.

8 inch	.....	each, \$0.40	12 inch	.....	each, \$0.65
10 "	.....	" .50	14 "	.....	" .85

## UNIVERSAL TIN SHADE.

FLAT CONE.

Patented.



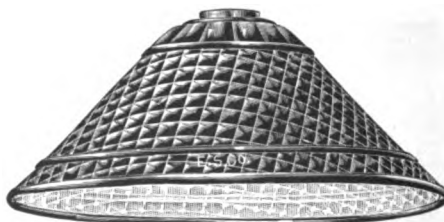
Green Outside, Bright Inside.

Requires no shade holder, no screws, no springs. Fits all lamp sockets. Saves time and always gives satisfaction.

No. 3871.	8 $\frac{1}{2}$ inches, to fit Edison sockets (shade only).....	each, \$0.25
" 3872.	8 $\frac{1}{2}$ " " other sockets (with coupling).....	" .30

## UNIVERSAL TIN SHADE.

DEEP CONE.



Green Outside, Bright Inside.

No. 3888.	To fit Edison sockets (shade only).....	each, \$0.65
" 3889.	" other sockets (with coupling).....	" .70

## ALUMINUM SHADES.



These Shades are spun from aluminum, in one piece, and are very elegant in appearance. They will not *tarnish*, and may be cleaned by simply wiping off with damp cloth or chamois.

No. 3868.	Frosted .....	each, \$0.70
" 3869.	Mottled .....	" .90

## ENAMELED PAPER SHADE.



This Shade is desirable when used with desk lights to reflect the light downward and prevent the rays from striking the eye.

No. 3906. Diameter, 10 inches; depth, 5 inches (without holder) ..each, \$0.35

# SILVER-PLATED MIRROR REFLECTORS.

## DEEP CONE REFLECTOR.



No. 3880.

2½ and 3½ inch Shade-Holder.

10 inch.....	each, \$2.25
12 ".....	" 2.50

## FLAT CONE REFLECTOR.



No. 3879.

2½ and 3½ inch Shade-Holder.

10 inch.....	each, \$1.85
12 ".....	" 2.10
14 ".....	" 2.30
16 ".....	" 3.00
18 ".....	" 3.70

## CONVEX REFLECTOR.



No. 3878.

2½ and 3½ inch Shade-Holder.

10 inch.....	each, \$2.05
12 ".....	" 2.30
14 ".....	" 2.60
16 ".....	" 3.25
18 ".....	" 4.15

In ordering reflectors, state size of holders they are to fit.

## MCCREARY REFLECTOR SHADES.

Patented.



This Shade is deserving of the highest recommendation. By its use the light is softened, and whitened, and increased two-fold. No one engaged in literary or desk work of any kind can afford to do without it, and it will be found serviceable in show windows, stores, and many other places.

- |           |  |                    |
|-----------|--|--------------------|
| No. 3891. | Seven-inch Shade. Opening at top, $2\frac{3}{4}$ inches; requires a $3\frac{1}{4}$ -inch holder; for a 10 to 24 C. P. lamp. This is the size mostly used for desk light and for portables, and may be placed near the object to be lighted                                 | .....each, \$ 2.80 |
| " 3892.   | Eight-inch Shade. Opening at top, $2\frac{3}{4}$ inches; requires a $3\frac{1}{4}$ -inch holder; for a 10 to 24 C. P. lamp. This is also used for desk light, but to obtain the best effect it should be suspended two or three feet above the object to be lighted        | ..... 3.20         |
| " 3893.   | Nine-inch Shade. Opening at top, $3\frac{1}{4}$ inches; requires a 4-inch holder; for a 32 C. P. lamp. This size is used for general lighting, and should be suspended four or five feet above the object to be lighted  | ..... " 4.80       |
| " 3895.   | Twelve-inch Shade. Opening at top, $3\frac{1}{4}$ inches; requires a 4-inch holder; for a 50 C. P. lamp. Useful in the lighting of rooms, or general display lighting  | ..... " 7.20       |
| " 3896.   | Fifteen-inch Shade (Mogul). Opening at top, $5\frac{1}{4}$ inches; requires a 6-inch holder; for a 100 or 150 C. P. lamp. Used for lighting churches, art galleries, public halls, and other places where a large, brilliant, soft and perfectly diffused light is desired | ..... " 14.40      |

In ordering, state kind of lamp used and candle power.

## MCCREARY MICA DUST PROTECTOR.

Patented.

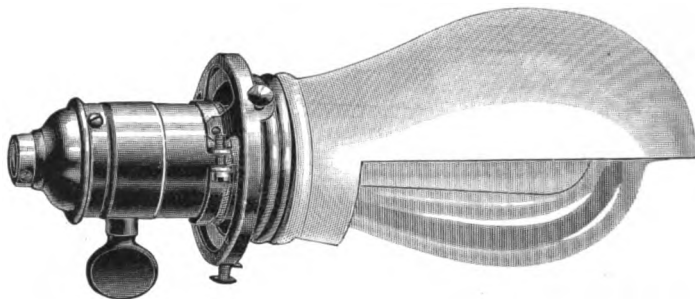


This Dust Protector fits closely inside the shade older, covering the top of the globe or shade, thereby preventing the accumulation of dirt and bugs in the shade, and the consequent diminishing of the light.

- |           |                                       |                   |
|-----------|---------------------------------------|-------------------|
| No. 4012. | For $3\frac{1}{4}$ -inch Shade Holder | .....each, \$0.10 |
| " 4013.   | " 4 " " " " "                         | ..... " .20       |
| " 4014.   | " 6 " " " " "                         | ..... " .60       |

## MCCREARY REFLECTOR HALF SHADES.

Patented.



This form of shade will be found of more advantage than any other for billiard tables, desks, and for any incandescent lamp that is not placed in a perpendicular position. Fits a  $2\frac{1}{4}$  inch shade-holder.

No. 4017.	For a 16 C. P. Lamp,	Opal	.....	each, \$1.20
" 4018.	" " " "	Silvered	.....	" 1.40
" 4019.	" " " "	Crystal roughed	.....	" 1.30
" 4020.	" 32 " "	Opal	.....	" 1.35
" 4021.	" " " "	Silvered	.....	" 1.60
" 4022.	" " " "	Crystal roughed	.....	" 1.40

We will also furnish, to order, blue, green, yellow, or red colored shades.

## HALF REFLECTOR SHADES.

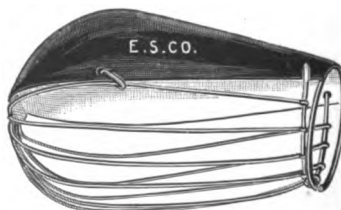


Green outside, glossy enamel white inside;  $2\frac{1}{4}$  in. shade-holder.

No. 3854.....each, \$0.50

## METAL HALF REFLECTOR.

With Hinge Wire Guard.



Green outside, glossy enamel white inside;  $2\frac{1}{4}$  in. shade-holder.

No. 3855.....each, \$0.75

# SILVER-PLATED MIRROR REFLECTORS.

## CLUSTER REFLECTOR.

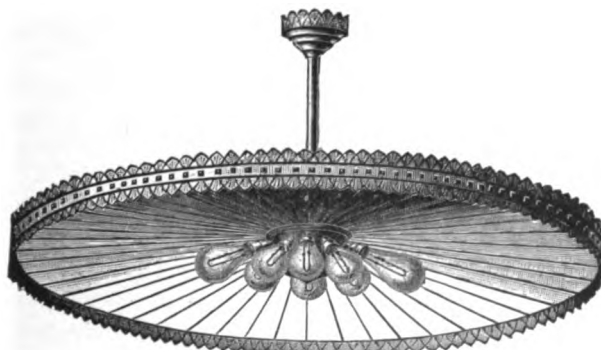


No. 3885.

			Wired complete.	Reflector only.
20 inch.	For 3 lights	-----	\$22.00	\$ 6.50
24 "	" 4 "	-----	28.00	7.50
30 "	" 6 "	-----	37.50	16.25
35 "	" 8 "	-----	52.00	26.00

Prices do not include incandescent lamps or sockets.

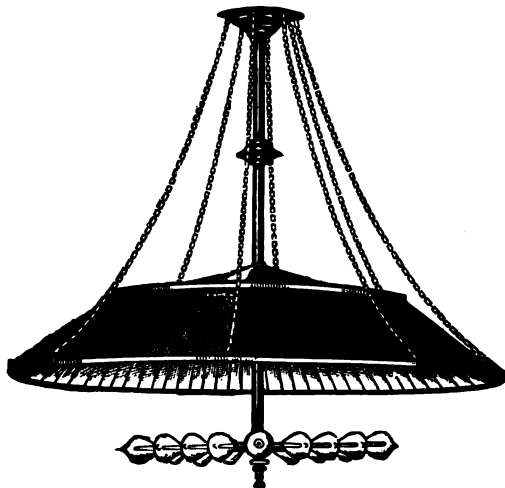
## CLUSTER REFLECTOR.



No. 3886.

			Wired complete.	Reflector only.
20 inch.	For 3 lights	-----	\$29.25	\$13.75
24 "	" 4 "	-----	36.00	19.50
30 "	" 6 "	-----	46.25	25.25
35 "	" 8 "	-----	61.75	35.75

Prices do not include incandescent lamps or sockets.

**SILVER-PLATED MIRROR REFLECTORS.****TRIPLE CONE REFLECTOR.****No. 3884.**

40 inch.	For 12 lights	.....	each, \$111.00
50 "	" 18 "	.....	" 148.50
60 "	" 24 "	.....	" 185.50
72 "	" 36 "	.....	" 269.00
84 "	" 48 "	.....	" 362.00

**TRIPLE CONE REFLECTOR.****No. 3852.**

40 inch.	For 12 lights	.....	each, \$150.00
50 "	" 18 "	.....	" 195.00
60 "	" 24 "	.....	" 245.00
72 "	" 36 "	.....	" 340.00
84 "	" 48 "	.....	" 465.00

Prices on this page include fixtures complete, wired for 16 C. P. lamps, but do not include the lamps or sockets.

## SUNBEAM INCANDESCENT LAMP.

Manufactured under Patents.



The Electrical Supply Co., Western Agents.

The largely increased sales of the Sunbeam Incandescent Lamp is conclusive evidence of its superiority and the esteem in which it is held by numerous central stations. All that care and skill can accomplish are devoted to the manufacture of the Sunbeam, and every lamp, before leaving the factory, is carefully tested by the latest and most improved devices as to its efficiency and candle power. The carbon filament, which is the vital point of excellence of an incandescent lamp, is of the purest quality and uniform in texture.

It is, however, well to remember that as the conditions are frequently radically different in lighting stations, it follows that a lamp that may prove highly satisfactory to one will not give the same satisfaction to another.

In order to meet these requirements the Sunbeam Incandescent Lamps are made of any desired efficiency, and therefore we can satisfy any central station if we are but given to understand all the conditions which the lamp is expected to meet. We can affirm positively, from extensive and careful tests made at various times, that the Sunbeam Lamp will maintain its rated candle power for a greater number of hours, and with a less expenditure of current, than any of the lamps which are at present being offered to the public.

In ordering Sunbeam Lamps, it is of the utmost importance that it be distinctly stated whether long-lived lamps or high-efficiency lamps are desired.

## SUNBEAM INCANDESCENT LAMPS

*Continued.*

**PEAR SHAPE. 16 C. P.**



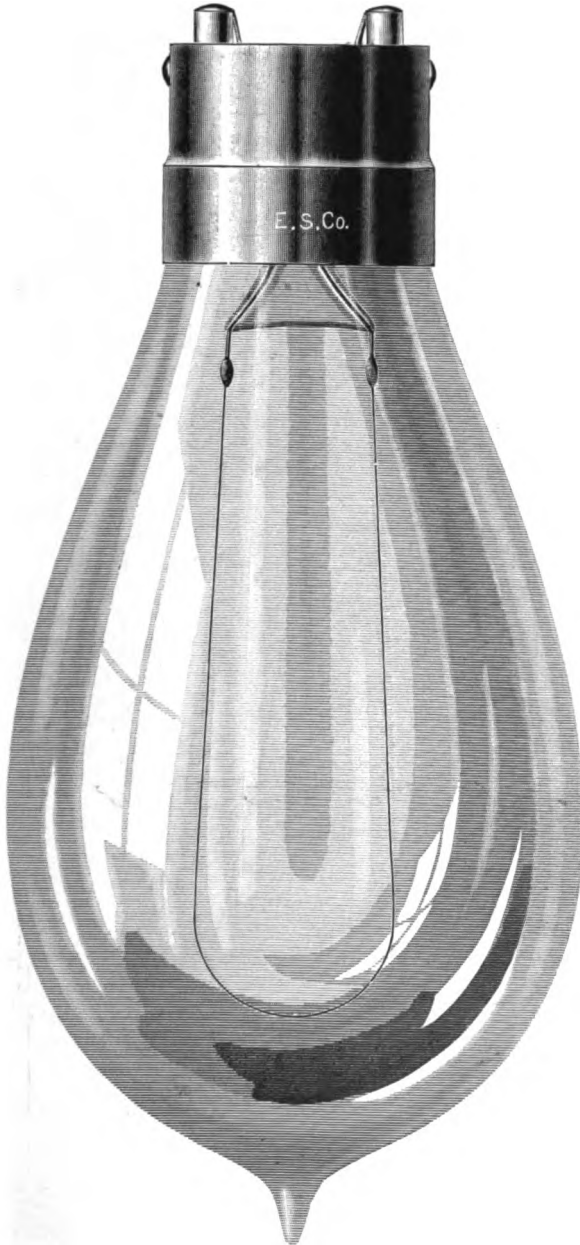
**Cut Full Size.**

For prices, see page 268.

## SUNBEAM INCANDESCENT LAMPS

*Continued.*

**PEAR SHAPE. 50 C. P.**



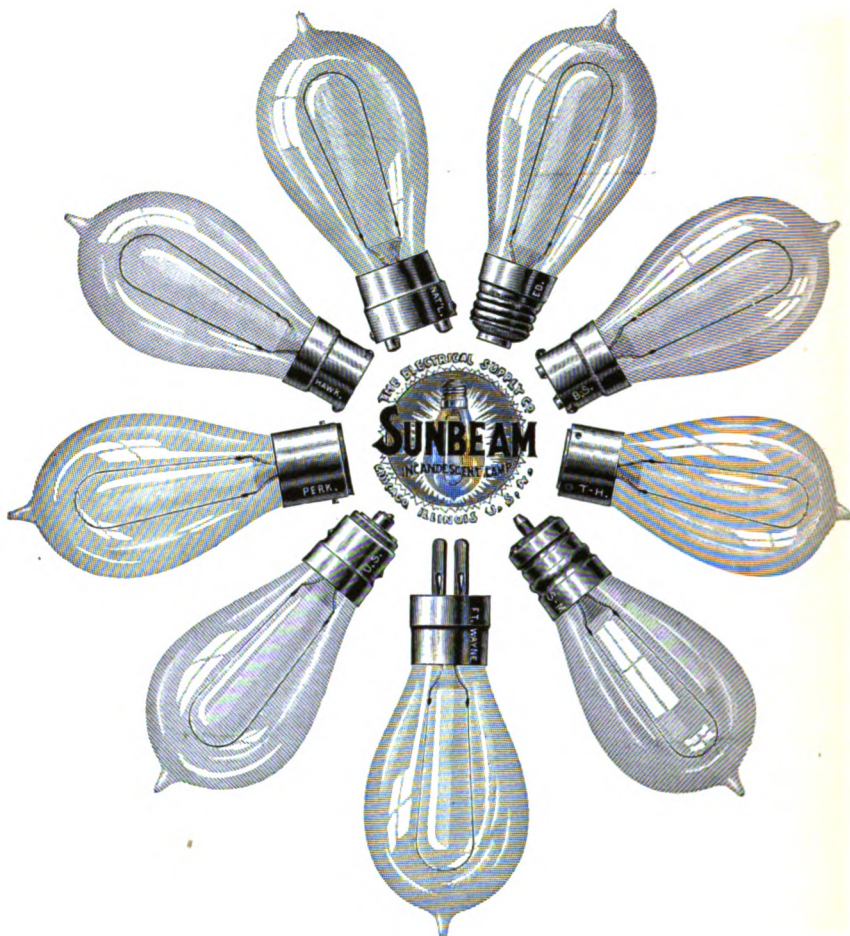
**Cut Full Size.**

**For prices, see page 268.**

# SUNBEAM INCANDESCENT LAMPS

*Continued.*

**PEAR SHAPE.**



## PRICE LIST.

Trade No.	Candle Power.	Plain.	Frosted.	Colored.
3036	8	\$ .80	\$ .95	\$ .95
3037	10	.80	.95	.95
3038	16	.80	.95	.95
3039	24	.95	1.25	1.25
3040	32	1.10	1.40	1.40
3041	50	1.80	2.10	2.10

In ordering, state as follows :

Trade Number, Voltage, Base.

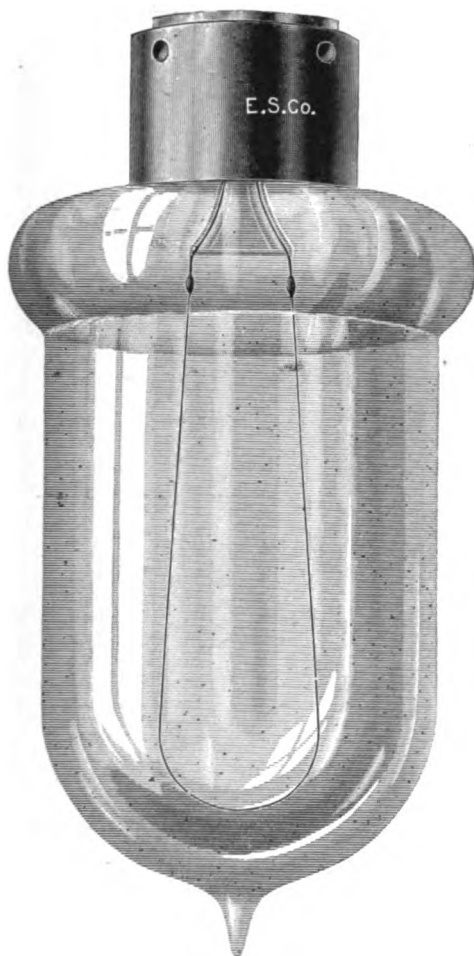
Plain, Frosted, or Colored (red, green, blue, or amber).

High-efficiency Lamp or Long-lived Lamp.

# SUNBEAM INCANDESCENT LAMPS

*Continued.*

**ACORN SHAPE. 16 C. P.**



**Cut Full Size.**

## PRICE LIST.

Trade No.	Candle Power.	Plain.	Frosted.	Colored.
3045	8	\$ .85	\$1.00	\$1.00
3046	10	.85	1.00	1.00
3047	16	.85	1.00	1.00
3048	24	1.00	1.30	1.30
3049	32	1.20	1.50	1.50

In ordering, state as follows:

Trade Number, Voltage, Base.

Plain, Frosted, or Colored (red, green, blue, or amber).

High-efficiency Lamp or Long-lived Lamp.

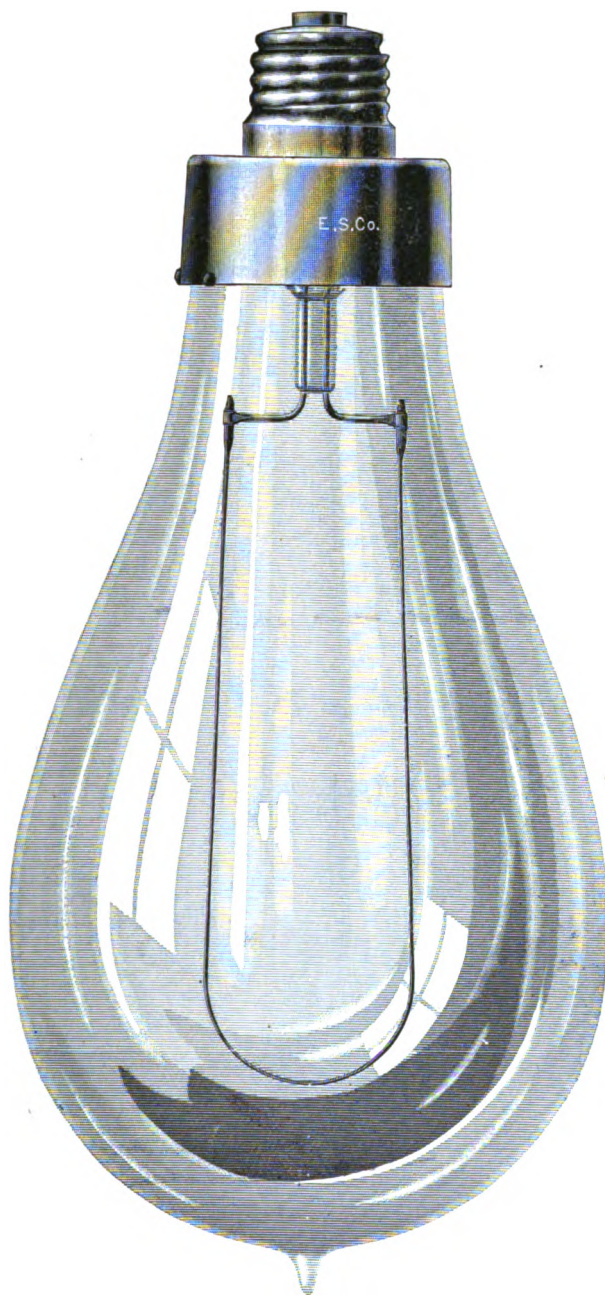
**SUNBEAM INCANDESCENT LAMPS—Continued.****ACORN SHAPE, WITH MIRROR. 16 C. P.****Cut Full Size.**

The shape of this lamp permits of the top being silver-plated, making a reflecting mirror, which increases the effective rays fully 50 per cent.

**PRICE LIST OF ACORN SHAPE, WITH MIRROR REFLECTOR.**

Trade No.	Candle Power.	Each.
3053	8	\$1.10
3054	10	1.10
3055	16	1.10
3056	24	1.35
3057	32	1.50

In ordering, state as follows : Trade Number, Voltage, Base.

**ECONOMIC HIGH CANDLE POWER INCANDESCENT LAMPS.**

Trade No.	Candle Power.	Price, Each.	Trade No.	Candle Power.	Price, Each.
3077	75	\$3.20	3079	125	\$5.00
3078	100	4.25	3080	150	6.50

In ordering, state as follows: Trade number, Voltage, Base.

## MINIATURE INCANDESCENT LAMPS.

Cuts Actual Size.



$\frac{1}{2}$ -Candle Lamp.

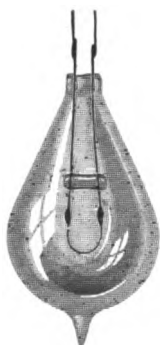


1-Candle Lamp.

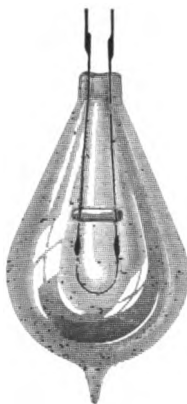


2-Candle Lamp.

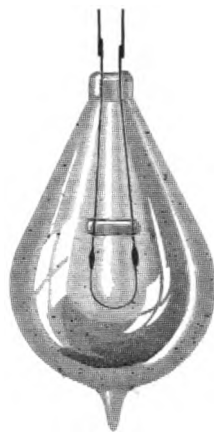
Trade No.	Candle Power.	Resistance. Ohms.	Electro-Motive Force. Volts.	Current Required Approx. Amperes.	Each.
3690 $\frac{1}{2}$	$\frac{1}{2}$ -Candle ----	1.3 to 2	3 to 4	1 to 1.5	\$1.50
3691	1 " ----	2.0 to 4.5	3.5 to 5	1 to 1.5	1.50
3692	2 " ----	3.3 to 5	4 to 5	1 to 1.5	1.50



3-Candle Lamp.



4-Candle Lamp.



6-Candle Lamp.

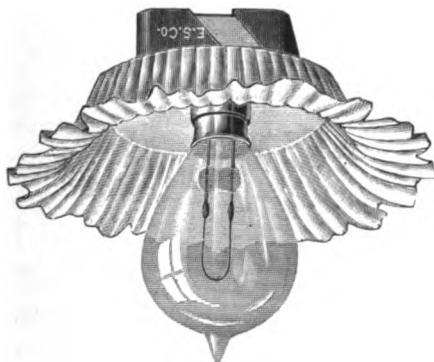
Trade No.	Candle Power.	Resistance. Ohms.	Electro-Motive Force. Volts.	Current Required Approx. Amperes.	Each.
3693	3-Candle ----	3.6 to 4.5	5 to 6	1 to 1.5	\$1.50
3694	4 " ----	5 to 6.5	5 to 6	1 to 1.5	1.50
3696	6 " ----	6 to 7	6 to 12	1 to 1.5	1.50

## MINIATURE LAMP HOLDER.



No. 3626 ..... each, \$0.40

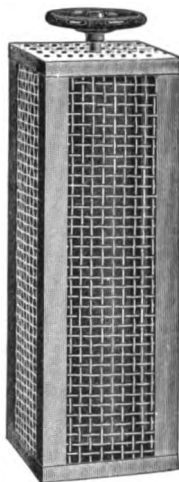
## MINIATURE PAPER SHADE.



No. 3628 ..... each, \$0.05

## WIRT STAGE REGULATOR.

Patented.



This Stage Regulator has the great advantage over all others of giving a perfectly continuous variation of the light without step or jump. The importance of this feature can best be realized by those who have had experience with other forms, which usually have from six to sixty steps or blocks in the switch. This regulator is invariably built fire-proof, which permits of working at a fairly high temperature, with the result of making the total size very moderate. They may be placed in any position, and if desired may be put at a distance from the "prompt-stand," connection simply being made by extending the shaft. This arrangement is much more economical and satisfactory than the alternative one of running a large number of connecting wires between the switch and the regulator proper. Either wheels or levers can be used as desired. These regulators are built only to order. Always give the maximum current to be carried and the total resistance the regulator is to have. If this can not be stated, give the number of lamps, with the voltage and system in use.

Prices furnished upon application.

## WIRT ELECTRICITY METER.



This meter has been designed to meet the practical needs of practical men. The action was selected with a full knowledge and after a careful consideration of all the forms of action for supply meters. It contains no mechanism or principle of action not easily understood by the average station electrician. No special pains are required in setting up and connecting, being sent out complete and ready for work when screwed into place and the wires connected. The action of the meter is purely mechanical, and this action was chosen because it is always possible to get assistants who can understand and care for mechanism of this class—chemical and electro-magnetic mechanisms having proved to be successful only in the care of well-trained technical hands. This meter is very solidly made and placed in a case designed to afford the fullest protection, but we recommend that it be not placed in damp, dark, or dirty locations, but preferably where it can be easily read every month and without difficulty inspected every year or two.

Meters of all sizes, as usually made, read direct on the dials in ampere hours. If desired, they can be made to read direct lamp hours for any particular lamp.

No. 3250.	Capacity, 10 Amperes, for Direct Current	each, \$35.00
" 3260.	" 10 " " Alternating "	" 35.00
" 3252.	" 20 " " Direct "	" 35.00
" 3262.	" 20 " " Alternating "	" 35.00
" 3256.	" 40 " " Direct "	" 35.00
" 3266.	" 40 " " Alternating "	" 35.00

Special sizes, up to 1,000 amperes, made to order. Also three-wire meters.



## ELECTRIC MOTORS.

THE Electric Motor for the transmission of power for practical purposes is now so commonly in use, that it offers indications of becoming universal in its application. Those in charge of factories, machine shops, and other places where power is demanded, are rapidly coming to the conclusion that greater safety, economy, and convenience may be realized from the use of the electric motor than from other methods. The motors illustrated and described in this section have been selected with great care as to their merit, and passed upon by expert opinion. From the little fan motor to those of larger power, we are assured that they are entitled to serious attention and consideration.

## STANLEY FAN MOTOR.

For Alternating Currents.

The Electrical Supply Co., Western Agents.



No. 3454.

This Motor is more efficient than most of the alternating current motors on the market, taking only one ampere of current. It does not heat, makes no noise, and has no effect upon lamps in circuit. *It gives just enough, but not too much breeze.*

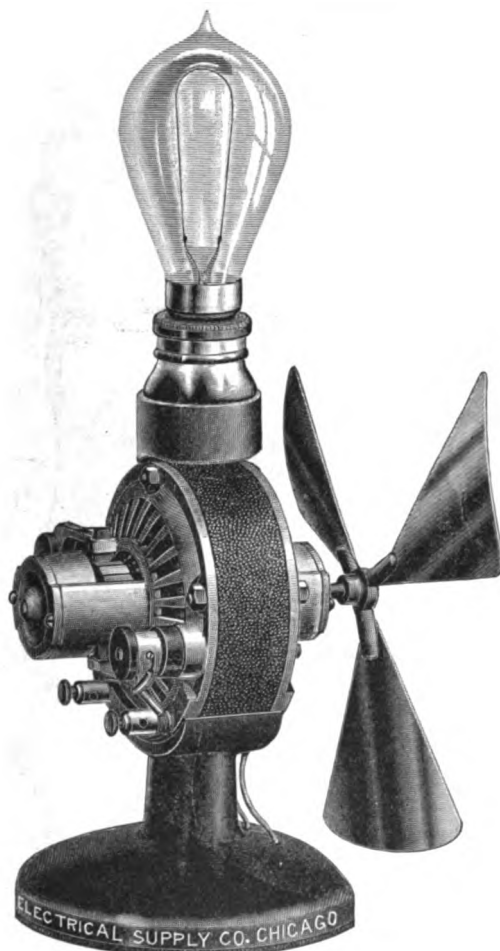
When not otherwise specified, it is wound for 50-volt circuits, but can be furnished for 100-volt circuits when desired.

Each .....\$20.00

## STANLEY FAN MOTOR

*Continued.*

**For Continuous Currents.**



**No. 3456.**

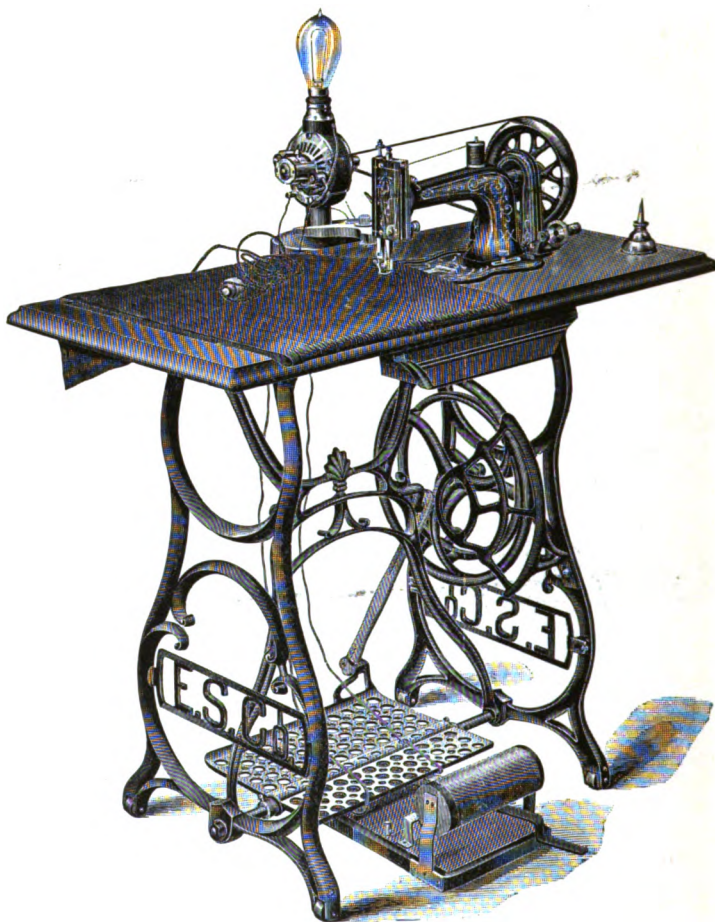
The great success which has attended the use of the Stanley Fan Motor for alternating currents has led to its adaption to continuous currents. No small motor has ever been made with the minute perfection to detail in every part which is shown in the design of the Stanley, and no motor has been so successful for continuous operation in ordinary hands without attention.

The speed can be varied considerably by choosing the lamp to be used. State system for which the motor is to be used, in order that the proper socket may be sent. As the pressure found on various continuous current circuits varies so widely, it has been found necessary to place a lamp socket on the Stanley Motor. This permits of adjustment to various pressures by changing the lamp, and of getting different speeds out of the same motor on the same circuit, when desired, by the simple expedient of using lamps of different voltages.

Complete, with Key, Socket, Cord, and Plug ..... each, \$21.00

## STANLEY MOTOR.

For Sewing Machines and Small Machinery.



These outfits have been designed with care, and can be expected to give satisfactory results in the hands of any intelligent person. We have particularly tried to avoid the usual troubles incident to the use of these small motors, caused by lack of special skill on the part of the user.

Outfit No. 3474 consists of one Stanley Fan Motor, provided with both fan and pulley, and adapted to run on a 50-volt *alternating* incandescent current; one clamp for attaching the same to sewing machine or table; one foot controller for regulating speed, starting or stopping; one roll of cotton rubber belting; one connecting cord with plug; one connecting cord with tips.

Outfit No. 3475 is the same as outfit No. 3474, with the exception of the motor, which is wound for from 90 to 110 volts, *direct* or *alternating*.

Each ..... \$35.00

## STANLEY MOTOR

*Continued.*

**For Sewing Machines and Small Machinery.**

### **DIRECTIONS FOR PLACING AND USE.**

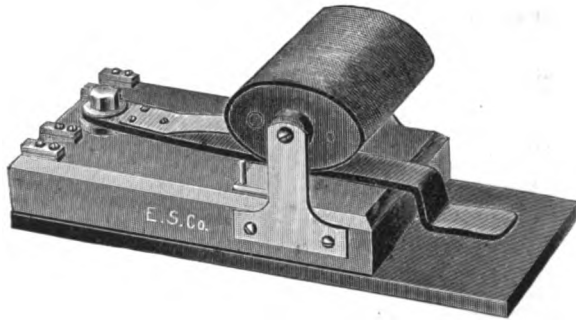
Unpack carefully and see that all the parts are complete. See that the motor is rated for the current for which it is to be used. *Do not use a 50-volt motor on a 100-volt circuit or vice versa.* Put the base of the motor in the clamp and attach the clamp to the table. Before screwing up the clamp tight see that the motor pulley is in line with the sewing-machine pulley. The motor can be set either right or left in its seat as may be required to bring the rotation in the proper direction. After getting in position, screw up the clamp *tight*, so that it can not slip or work out of place. Measure off sufficient belting to go round the pulleys and lap two inches; lay the ends together smoothly and press so that they will adhere to each other, after which stitch across each end. Attach the cord with the plug to the binding posts on the controller marked "line." Connect the binding posts marked "motor" by means of the other cord to the motor binding posts. Attach the connecting plug to a lamp socket and turn on the current. The regulator can be placed on the floor where the foot can reach it easily without any strain to the body, and the motor can be started or stopped, or the speed changed, by a slight movement of the foot on the pedal.

**BRUSHES.**—Extra brushes are sent with each machine, and brushes must be replaced before they are badly worn. Bearings are supplied with sufficient grease to last several months, after which they should be refilled with vaseline by removing the end plate.

Do not attempt to run the machine by belting to the grooved pulley. The belt should run over the outside of the hand wheel as shown in the cut. This is the only way in which sufficient speed on the motor can be secured to permit it to do its work efficiently. Belting the motor to a small pulley means reducing its speed at the expense of power.

We call particular attention to the merits of our foot regulator, which is the only one made doing away entirely with the use of the sewing-machine treadle, with its attendant unnatural position and injurious muscular strain. This arrangement does away entirely with the last objection to the use of the sewing machine by women who are not robust.

## FOOT REGULATOR.



This Regulator is designed to render the control of the sewing machine thoroughly convenient and perfect without calling upon the hands of the operator to do any part of the work. The speed can be increased and diminished and the current turned on or turned off by a movement of the foot. Foot regulators for such work have heretofore been made, acting from the motion of the ordinary treadle of the sewing machine. This method is unsatisfactory for the reason that it fails to relieve the operator of the strained position required when the feet are used in connection with the sewing machine treadle. Our Regulator, being detached and movable, can be placed in such position on the floor that the operator may take a natural, easy position without awkwardness or straining. By its use it will be possible for women to operate the sewing machine continuously without fatigue, who otherwise would be unequal to such a task.

This Regulator is equally well adapted for control of motors running dental engines, jewelers' lathes, etc.

No. 3119..... each, \$10.00

## CLAMP FOR STANLEY MOTOR.

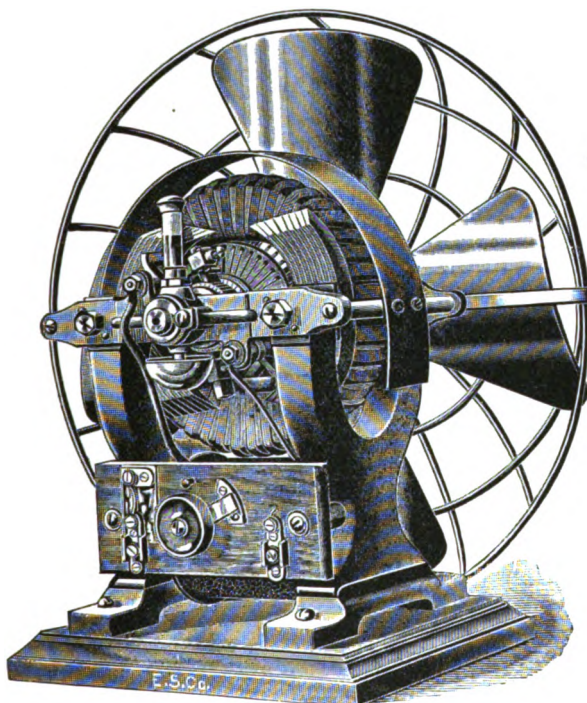


For use in attaching the Stanley Motor to tables, sewing machines, shelves, or any other flat surface.

No. 3120..... each, \$2.50

## FAN MOTOR.

GRAMME TYPE.



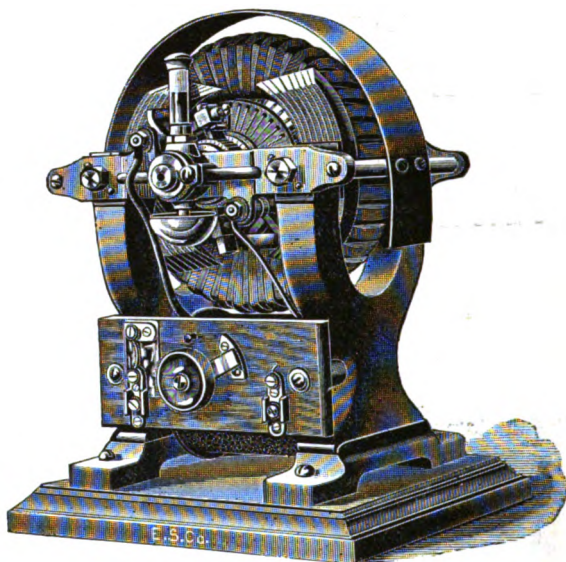
Wound for 100-110 Volts.

These Motors are of the well known "Edison Slow-Speed Type," and are very efficient and quiet. They run with less attention than any other small motor made.

No. 3104.	Motor and Fan.....	each, \$40.00
" 3104C.	" Fan and Guard.....	" 42.50
" 3104G.	Guard only.....	" 2.50

## SLOW SPEED MOTOR.

### GRAMME TYPE.



The general arrangement of the Motor is shown in the cut. The armature revolves in a magnetic field, the lines of force being brought through the armature on both sides of the ring by means of specially-shaped pole pieces, made of the softest Norway iron.

The poles, being built in strips, secure a lamination which prevents the heating of the fields, thus permitting the motor to run cool, even when overloaded. These wrought-iron pieces are attached to the magnetic frame, which, at the same time, forms the base upon which the machine is mounted.

The single field magnet coil is placed below the armature. This brings the centre of gravity down low, and hence adds to the steadiness and solidity of the machine.

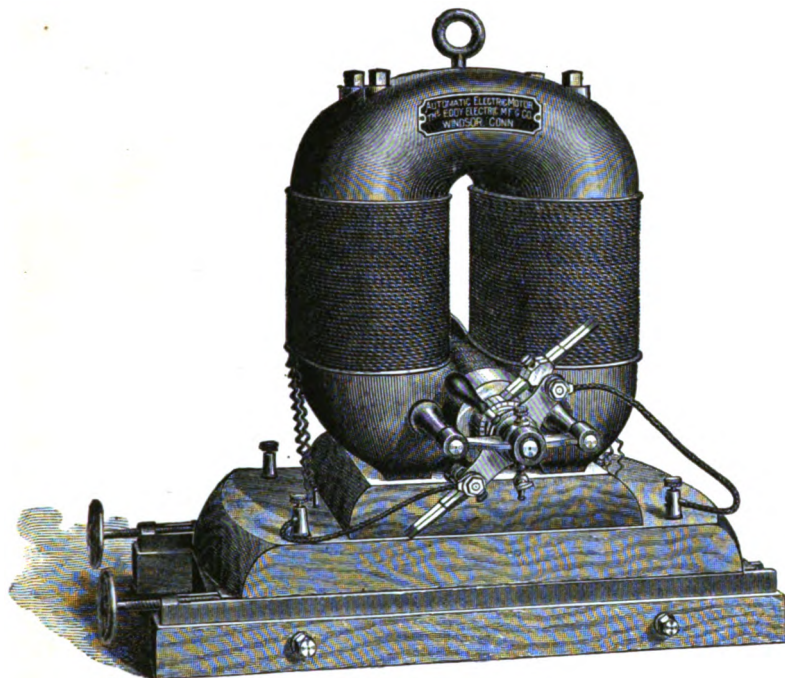
The armature is built of the softest laminated wrought iron, and is provided with teeth. The coils are placed in hollows formed by these teeth, which secure them firmly in position, give them a positive driving arrangement, and prevent slipping of the coils.

This construction also allows the projecting teeth to be brought in the closest possible proximity to the pole pieces, so that the field magnets can be brought very close, lessening the air gap, without the slightest danger of abraiding the winding of the armature.

### PRICE LIST.

Trade No.	Volts.	Horse Power at Full Load.	Winding.	Revolutions per Minute.		Weight in Pounds, Net.	List Price.
				Light Load.	Full Load.		
3106	120	$\frac{1}{2}$	Series.	4400	2000	14.75	\$ 20.00
3107	120	$\frac{3}{4}$	"	2900	1675	20.25	40.00
3108	120	1	"	2500	1100	28.50	80.00
3109	120	$\frac{3}{2}$	Shunt.	1710	1300	37.60	100.00

## THE EDDY MOTOR.



The Eddy Motor is made with a modified ring form of field magnet, and a uniform path is provided for the magnetic lines of force, while no angles or corners entail a loss of magnetism. As a result, a strong field is secured by the expenditure of very little electrical energy. As the armature is wound for low resistance, a motor of great efficiency is produced, having a perfect automatic regulation of speed, as well as freedom from sparking. The mechanical construction of the Eddy Motor is excellent, and with the advantage of occupying a very small amount of floor space, and the slight loss in transmission, it offers special inducements to the purchaser in search of an economical and serviceable motor.

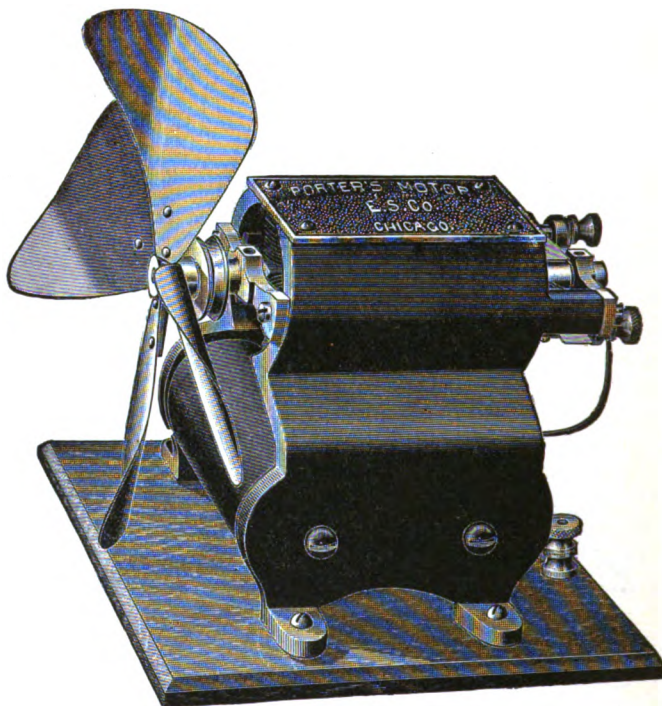
### PRICE-LIST AND DIMENSIONS.

Trade No.	H. P.	Weight.	Pulley Diam. Face.	* Speed.	Price.
3372	$\frac{1}{2}$	200	$3\frac{1}{2} \times 2\frac{1}{2}$	2350	\$ 175
3378	1	300	$4 \times 2\frac{1}{2}$	2100	200
3374	2	400	$6 \times 3\frac{1}{2}$	1800	250
3375	3	500	$6\frac{1}{2} \times 3\frac{1}{2}$	1800	350
3376	4	700	$7 \times 3\frac{1}{2}$	1875	410
3377	5	800	$7 \times 3\frac{1}{2}$	1850	475
3378	$7\frac{1}{2}$	950	$7\frac{1}{2} \times 4$	1675	600
3379	10	1,150	$8 \times 6$	1650	700
3380	15	1,390	$8 \times 6$	1625	900
3381	20	1,900	$10 \times 7$	1300	1,100
3382	25	2,500	$11 \times 8$	1200	1,300
3383	30	3,000	$12 \times 9$	1125	1,500
3384	40	4,000	$13\frac{1}{2} \times 10$	1000	2,000
3385	50	5,000	$14\frac{1}{2} \times 11$	900	2,500

\* Speed will vary somewhat from table. For exact speed, see installing sheet.

## THE PORTER MOTORS.

For Battery Currents of from 2 to 10 Volts.



No. 3358.

These Motors are exceptionally well made, both electrically and mechanically, and are the only motors we have yet found that are thoroughly reliable for battery currents. Nos. 3356 and 3357 are adapted for operating fans, mechanical toys, music boxes, etc. Nos. 3358 and 3359 will operate sewing machines, small lathes, ventilating fans, and similar light mechanical work.

### PRICE LIST.

No. 3356.	2 volts, size 3 in. x 3 in., weight $1\frac{1}{2}$ lbs.	each, \$ 4.00
" 3357.	4 " $\frac{1}{8}$ h. p., size 4 in. x 4 in., weight 3 lbs.	" 6.50
" 3358.	6 " $\frac{1}{4}$ " " $5\frac{1}{2}$ in. x $4\frac{1}{2}$ in., " 6 "	" 12.00
" 3359.	10 " $\frac{1}{2}$ " " $5\frac{1}{2}$ in. x $4\frac{1}{2}$ in., " 10 "	" 18.00

### DIRECTIONS FOR USE OF PORTER MOTORS.

See that the brushes are properly adjusted, bearing lightly on commutators for light currents, and more heavily for stronger currents. Use small amount of sperm oil on the bearings, taking care that none gets on the commutator.

### FANS.

5 inch fan for No. 3356 motor	each, \$ .40
6 " " 3357 "	" .60
7 " " 3358 "	" 1.00
8 " " 3359 "	" 1.20

We recommend as batteries best suited for operating these motors, the Phonograph Battery or the Edison-Lalande Batteries, illustrated and described on pages 431 and 433.

## TOOLS AND

## CONSTRUCTION MATERIAL

Designed for Use in Electric Light and Power Work.

WE SHOW in this section a large number of tools not heretofore carried and some special ones that we have had designed for us, and, with the many changes that have been made in sizes and styles, this important department of our business will be found to have fully kept pace with the improvements we have made in other branches. As we have with us men that have had long practical experience in electric light construction work, we are able to judge intelligently of what tools and devices will be found most serviceable.

The tools that are classed as regular hardware supplies, we have selected with no less care than the others. We have taken those of the very best quality only, and as our facilities for buying are equal to the best, we are able to offer them at low prices—probably much lower than they could be purchased in a hardware store, and the quality being more reliable—customers will find a decided advantage in buying all of their tools of us.

## SHOVELS.



No. 1761.	Pole Hole, Regular, 7 foot handle.....	each, \$1.00
" 1762.	" " " 8 " " .....	" 1.25
" 1763.	" " Heavy, extra-long straps, 7 foot handle....	" 1.50
" 1265.	" " " " " 8 " " .....	" 2.00

## SPOONS.



No. 1773.	Pole Hole, Regular, 7 foot handle.....	each, \$1.00
" 1772.	" " " 8 " " .....	" 1.25
" 1774.	" " Heavy, 7 " " .....	" 1.25
" 1775.	" " " 8 " " .....	" 1.50

## POLE HOLE AUGERS.



No. 1792.	Auger to bore hole 12 inches in diameter.....	each, \$4.00
" 1794.	" " " 14 " " .....	" 4.50

## "EUREKA" POLE HOLE DIGGER.



No. 1797.	For sand and loam soil.....	each, \$2.80
-----------	-----------------------------	--------------

## DIGGING BAR.



No. 1801. Round,  $1\frac{1}{8}$  inch diameter, 8 feet long, best steel.....each, \$3.00

## DIGGING BAR.



No. 1803. Octagon,  $1\frac{1}{8}$  inch diameter, 8 feet long, best steel.....each, \$3.20

## TAMPING BAR.



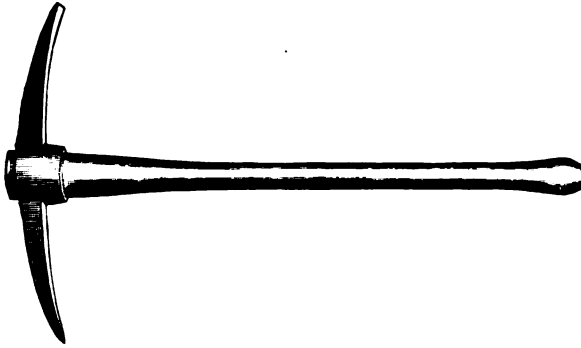
No. 1807. Wood, 7 feet long.....each, \$1.60

## CROW BARS.



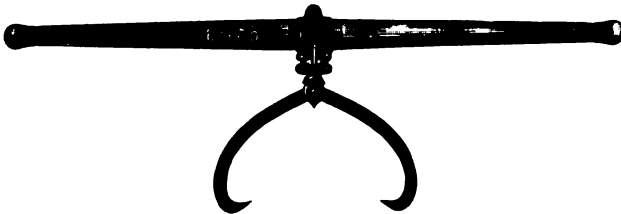
No. 1810. 4 feet long.....each, \$0.40  
 " 1811. 6 " " ..... " .75

## PICK AXE.



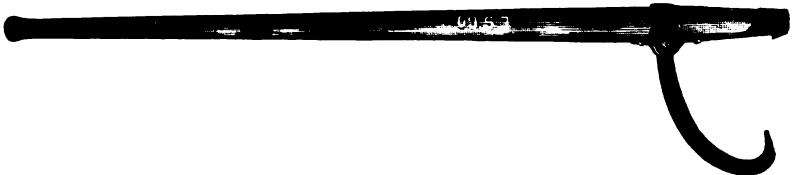
No. 1812. Price without Handles.....each, \$1.00  
 Handles only.....“ .45

## CARRYING HOOKS.



No. 1814. With Swivel.....each, \$4.00  
 “ 1815. Without “.....“ 4.00

## CANT HOOK.



No. 1818. Length, 4 feet.....each, \$2.40

## PIKE POLES.



No. 1820.	Length.....feet,	12	14	16	18
	Each .....	\$1.45	1.60	1.75	1.90

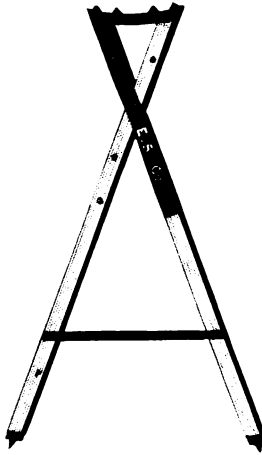
## RAISING FORKS.



No. 1840.	Length .....	feet,	12	14	16
	Each .....		\$2.00	2.10	2.20

## POLE SUPPORTERS.

## "JENNY" PATTERN.



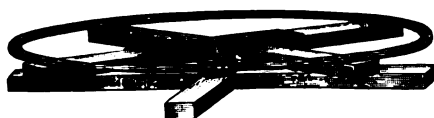
No. 1858.	Height .....	feet,	6	7½
	Each .....		\$5.50	6.00

## "MULE" PATTERN.



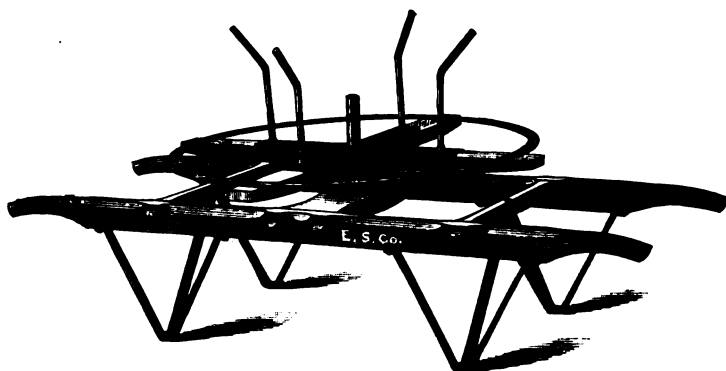
No. 1860.	Height .....	feet,	4½	6	7½
	Each .....		\$4.00	4.50	5.00

## COMMON PAY-OUT REEL.



No. 1871.....each, \$8.00

## COMBINATION PAY-OUT REEL.



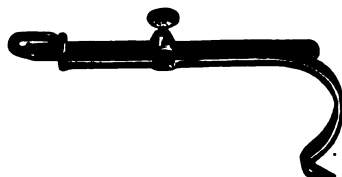
No. 1873.....each, \$16.00

## TAKE-UP REEL.



No. 1875.....each, \$16.00

## WOOD'S ADJUSTABLE CLIMBERS.



Can be folded up, permitting them to be placed in a tool bag.

No. 1893.	With straps, Nickel Plated.....	per pair, \$6.00
	Without straps, " .....	" 4.00

## CONOVER CLIMBERS.

Western Pattern.



No. 1891.	With straps.....	per pair, \$2.50
	Without straps .....	" 1.25
	Nickel Plated, extra .....	" 1.00

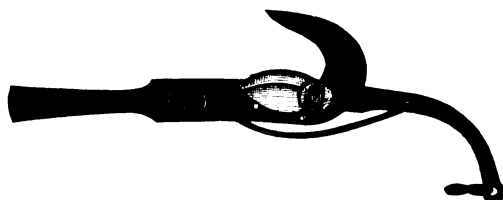
## CONOVER CLIMBERS.

Eastern Pattern.



No. 1895.	With straps.....	per pair, \$2.50
	Without straps .....	" 1.25
	Nickel Plated, extra .....	" 1.00

## TREE TRIMMERS.



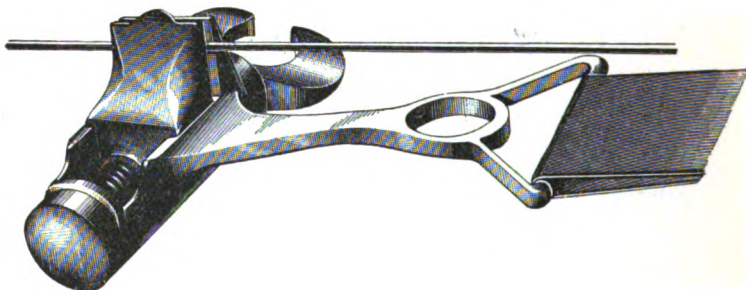
No. 1897.	Heavy, without pole.....	each, \$2.50
-----------	--------------------------	--------------

## TREE TRIMMER AND SAW COMBINED.



No. 1898. Hook and Saw ..... each, \$1.50  
 Hook only ..... " 1.00

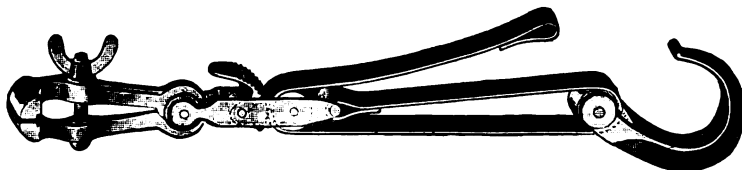
## "W. U." VISE AND COME-ALONG COMBINED.



Combination of Vise and Come-along, which for convenience, strength, and durability is not excelled. As a wire-stretcher, it has no superior; as a vise, it supplants all others now in use. They are made of the best cast steel, tempered by the most approved and modern process, and have been subjected to a severe test.

No. 1748. Each ..... \$3.00

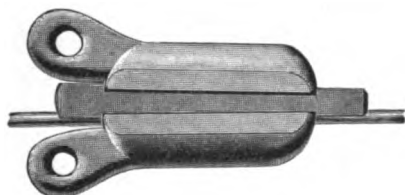
## HOWE'S LINE WIRE TIGHTENER.



For pulling up and holding line and guy wires, the use of rolls gives several times the power of the old methods; the grip is self-adjusting, and will hold in any position, at any point of the strap, and the hook adds greatly to the advantages of the whole tool.

No. 1924. Wire Tightener only (without Vise) ..... each, \$4.50  
 " 1924V. " " with 5½ in. Vise ..... " 7.70

## THE JONES WIRE CLAMP.

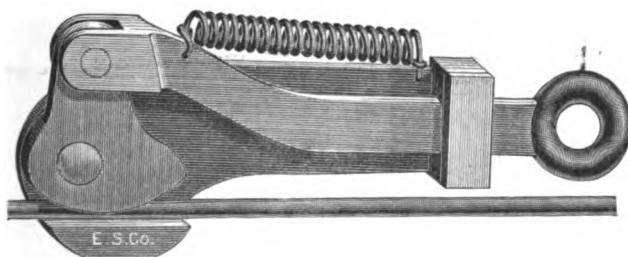


Will hold the wire firmly and will not injure it.

No. 1920. For Nos. 0 to 6 Wire .....each, \$4.00

## LANDEE WIRE CLAMP.

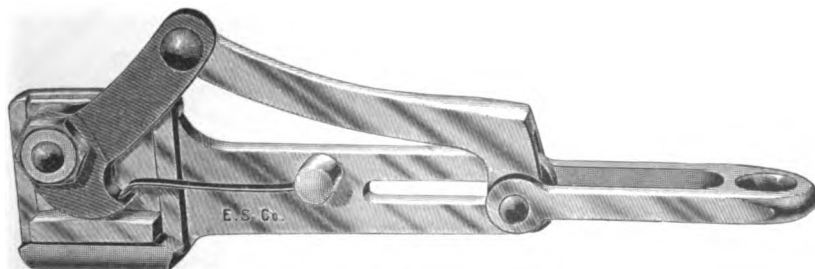
Patented.



Has a direct pull on the wire, and gets a firm hold without injuring the wire or insulation. It is easily applied, and the wire can not come in contact with clamps or blocks.

No. 1928. For No. 8 Wire or finer, suitable for telephone and telegraph line construction .....each, \$1.50  
 “ 1929. For No. 0 Wire or finer, suitable for electric light line construction ..... “ 1.70

## KLEIN'S COMPOUND ECCENTRIC.



For Hard-Drawn Copper Wire. Both the upper and lower bearings of this clamp are made of brass, and there is no danger of injuring the wire.

No. 1917. Each .....\$2.00

## ECCENTRIC CLAMPS.



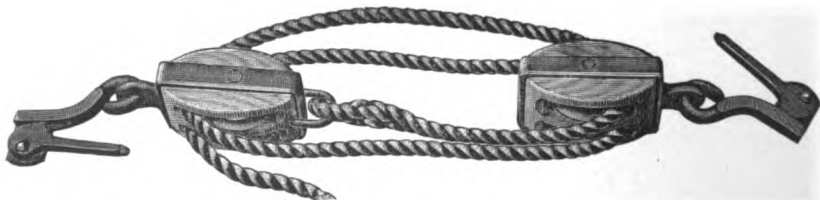
No. 1901.	Steel, for No. 9 B. & S. wire and finer	.....	each, \$1.25
" 1900 S.	Jack straps, extra	.....	" .75

## "COME ALONG" ECCENTRIC CLAMPS.



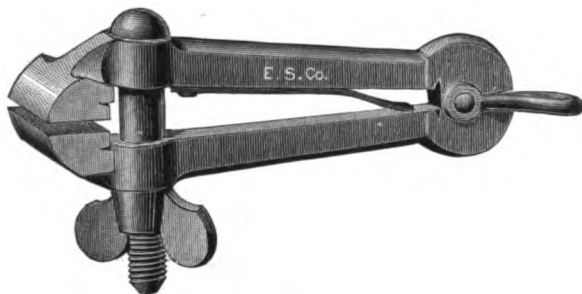
No. 1912.	Regular size for No. 9 B. & S. wire and finer	.....	each, \$ .60
" 1914.	Large " " 3 " " " " " " " " " "	.....	" 1.25
" 1916.	Extra large " " 3-0 " " " " " " " "	.....	" 2.00
" 1910 S.	Jack straps, extra	.....	" .71

## PULLEY BLOCKS AND ECCENTRIC CLAMP COMBINED.



No. 1921.	3½ inch blocks, with clamps that hold up to No. 8 wire, complete with 60 ft. rope.....	\$ 5.00
" 1921½.	3½ inch blocks, with clamps, without rope.....	4.50
" 1923.	5 inch blocks, with clamps that hold up to No. 2 wire, complete with 60 ft. rope.....	8.00
" 1923½.	5 inch blocks, with clamps, without rope.....	7.50

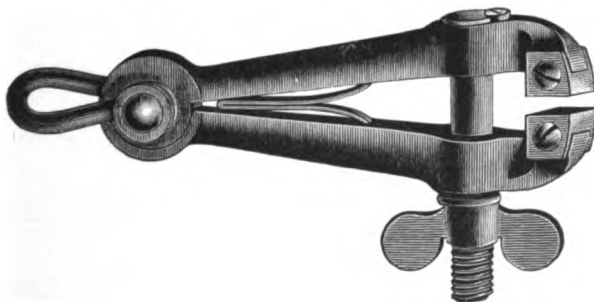
## STUBS' LINEMEN'S VISES.



No. 1745.

5½ inch, with loop.....	each, \$3.20
Strap for Vise, extra.....	“ .85

## HALL'S LINEMEN'S VISES.



No. 1750.

5 inch, with loop.....	each, \$2.50
6 “ “.....	“ 3.25
Straps for Vise, extra.....	“ 1.00
Extra Jaws.....	“ .25
“ Thumb Nuts.....	“ .21
“ Rings.....	“ .25
“ Springs.....	“ .25

## PATENT TACKLE BLOCKS.

Galvanized Iron. With Galvanized-Iron Sheaves and Steel Pins.  
Hooks and Straps Best Wrought Iron.

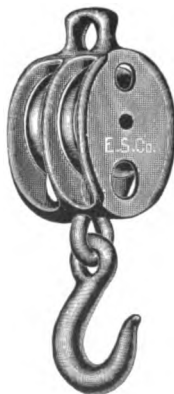
These Blocks are furnished with Steel Patent Roller Bushings, which make the pull easier, do not require oiling so often, and will last longer than Blocks with common galvanized-iron sheaves.

### ONE SHEAVE.



Trade No.	Correspond with Wooden Blocks, Inches.	Sheaves, Dia. Score.	For Rope, Inch Dia.	Galvanized Patent Sheaves.
4317	3	2 x $\frac{1}{2}$	$\frac{3}{8}$	\$ .95
4319	4	2 $\frac{1}{4}$ x $\frac{3}{8}$	$\frac{1}{2}$	1.30
4321	4 $\frac{1}{2}$	2 $\frac{3}{4}$ x $\frac{3}{4}$	$\frac{5}{8}$	1.50
4323	5	3 x $\frac{7}{8}$	$\frac{3}{4}$	1.75
4329	8	5 x 1 $\frac{1}{8}$	1	2.75

### TWO SHEAVE.



Trade No.	Correspond with Wooden Blocks, Inches.	Sheaves, Dia. Score.	For Rope, Inch Dia.	Galvanized Patent Sheaves.
4318	3	2 x $\frac{1}{2}$	$\frac{3}{8}$	\$1.60
4320	4	2 $\frac{1}{4}$ x $\frac{3}{8}$	$\frac{1}{2}$	2.35
4322	4 $\frac{1}{2}$	2 $\frac{3}{4}$ x $\frac{3}{4}$	$\frac{5}{8}$	2.65
4324	5	3 x $\frac{7}{8}$	$\frac{3}{4}$	3.00
4330	8	5 x 1 $\frac{1}{8}$	1	4.75

## WOOD TACKLE BLOCKS.

### ONE SHEAVE.



These Blocks are furnished with Steel Patent Roller Bushings, and extra heavy Straps.

Trade No.	Size—Inches.	Size Sheave.	For Rope. Inch Diameter.	Price.
4044	3	1 $\frac{3}{4}$ x 1 $\frac{1}{2}$ x $\frac{3}{8}$	$\frac{3}{8}$	\$ .70
4045	4	2 $\frac{1}{4}$ x $\frac{5}{8}$ x $\frac{3}{8}$	$\frac{1}{2}$	.85
4046	5	3 x $\frac{3}{4}$ x $\frac{3}{8}$	$\frac{5}{8}$	.90
4047	6	3 $\frac{1}{2}$ x 1 x $\frac{1}{2}$	$\frac{3}{4}$	1.10
4048	7	4 $\frac{1}{4}$ x 1 x $\frac{1}{2}$	$\frac{7}{8}$	1.30
4049	8	4 $\frac{3}{4}$ x 1 $\frac{1}{8}$ x $\frac{3}{8}$	1	1.65

### TWO SHEAVE.



Trade No.	Size—Inches.	Size Sheave.	For Rope. Inch Diameter.	Price.
4050	3	1 $\frac{3}{4}$ x 1 $\frac{1}{2}$ x $\frac{3}{8}$	$\frac{3}{8}$	\$1.30
4051	4	2 $\frac{1}{4}$ x $\frac{5}{8}$ x $\frac{3}{8}$	$\frac{1}{2}$	1.60
4052	5	3 x $\frac{3}{4}$ x $\frac{3}{8}$	$\frac{5}{8}$	1.75
4053	6	3 $\frac{1}{2}$ x 1 x $\frac{1}{2}$	$\frac{3}{4}$	2.00
4054	7	4 $\frac{1}{4}$ x 1 x $\frac{1}{2}$	$\frac{7}{8}$	2.40
4055	8	4 $\frac{3}{4}$ x 1 $\frac{1}{8}$ x $\frac{3}{8}$	1	2.85

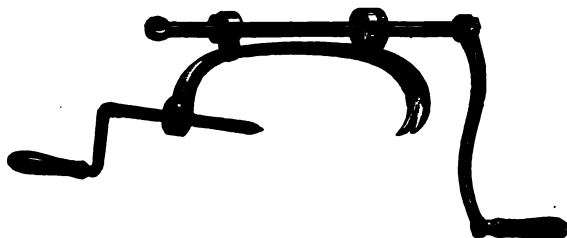
## PURE MANILLA ROPE.



The best quality obtainable.

Trade No.	Diameter.	Weight of 1,000 Feet.	Number of Feet in One Pound.	Strength of New Manilla Rope.	Price per Pound.
4340	$\frac{1}{4}$ inch.	23 lbs.	43	450 lbs.	\$0.30
4342	$\frac{3}{8}$ "	42 "	24	950 "	.30
4344	$\frac{1}{2}$ "	74 "	$13\frac{1}{2}$	1,700 "	.30
4345	$\frac{5}{8}$ "	101 "	10	2,300 "	.30
4346	$\frac{3}{4}$ "	132 "	$7\frac{1}{2}$	3,000 "	.28
4347	$\frac{7}{8}$ "	167 "	6	3,900 "	.28
4349	1 "	250 "	4	5,700 "	.28
4350	1 "	297 "	$3\frac{1}{8}$	6,750 "	.28
4353	$1\frac{1}{4}$ "	465 "	$2\frac{1}{4}$	10,600 "	.28
4357	$1\frac{1}{2}$ "	746 "	$1\frac{1}{8}$	16,900 "	.26

## THE GORSUCH GUY TWISTER.



The Guy Twister is clamped to a pole by means of a small, pointed crank-screw; and with a larger crank, to which the guy wires are attached, a perfectly even-twisted guy can be made in quarter the time occupied by the hand process. With this, one man can twist a guy, otherwise it will take two.

No. 1742.....each, \$8.00

## CONOVER SPLICING CLAMPS.



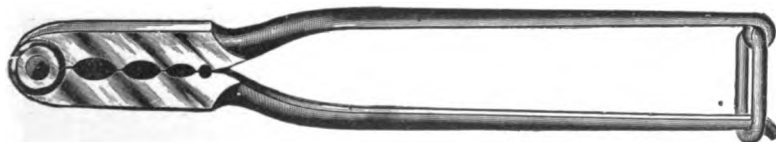
No. 1720. 4-hole for 8 B. & S. wire and finer.....each, \$2.00



No. 1722. 2-hole for 3 B. & S. wire and finer.....each, \$2.00



No. 1724. 2-hole for 0 B. & S. wire and finer.....each, \$2.00



No. 1725. 4-hole for 0 B. & S. wire and finer.....each, \$2.00

## SPLICING IRON.



No. 1740 .....each, \$0.80

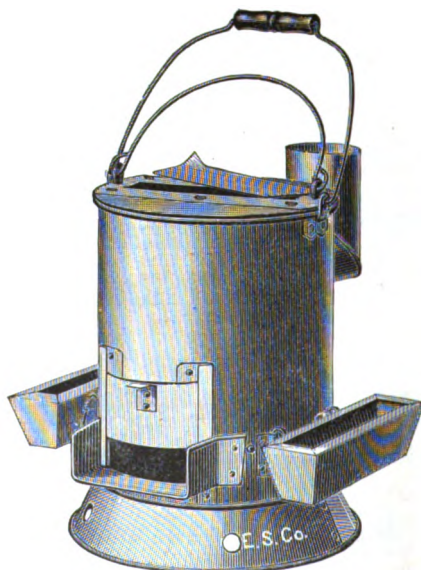
## SOLDERING FURNACES.

For Heavy Electric Light Line Work.



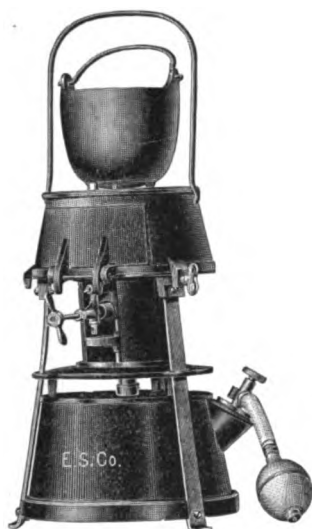
No. 2201. Each ..... \$8.00

For Light Electric Light Line Work.



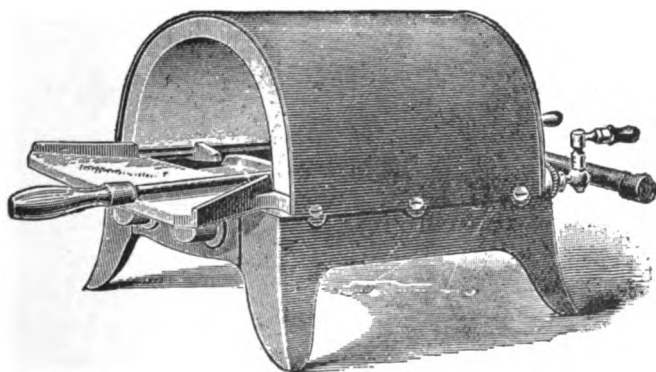
No. 2203. Each ..... \$6.50

## THE NEW AURORA FURNACE.



No. 2428..... each, \$12.00

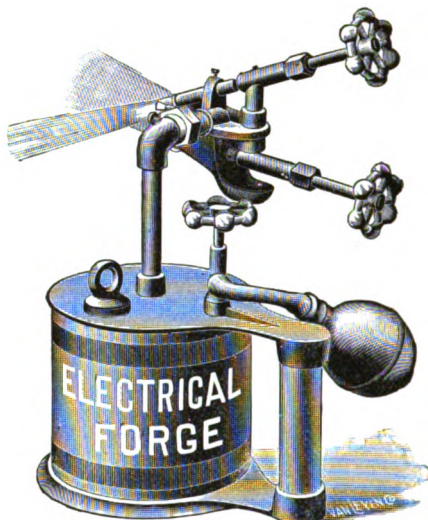
## GAS STOVE.



For heating soldering coppers where gas can be used. Can be attached to gas jet by means of rubber tubing.

No. 2429..... each, \$8.00

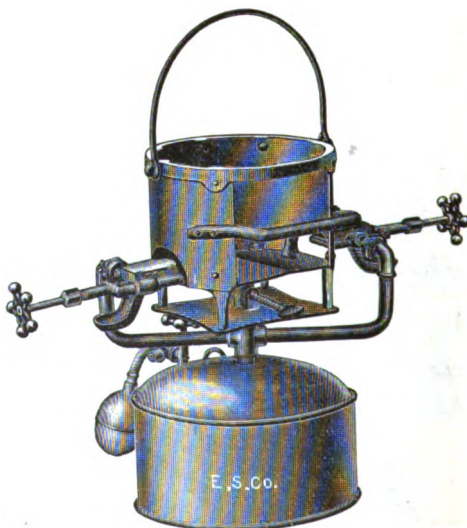
## ELECTRICIAN'S DUPLEX TORCH.



Has a reversible burner that can be used in any position; will not blow out in a gale of wind. Can be used as a blow-pipe torch, or a fantail heater, and can be instantly changed from an intense heat to a feeble flame, or the reverse.

No. 2204 .....each, \$6.00

## THE "HELPER" FIREPOT.



Used for melting solder for dipping joints, or for heating soldering irons. Can also be taken apart and used as a reversible torch. Will work in a gale of wind, and one-half gallon of 74° deodorized gasoline will run it for eight hours.

No. 2206 .....each, \$12.00

## PORTABLE SOLDERING STOVE.

For Charcoal.



No. 2205..... each, \$3.00

## GASOLINE TORCH.



Gives a very hot flame and is designed for soldering electric light wires. It can also be used for any kind of soldering, brazing, tempering, and general shop use.

No. 2211.	Complete.....	each, \$6.00
	Burner Head, complete.....	“ 3.00
	Needle Screw.....	“ .40
	Perforated Cylinder.....	“ .96
	Gooseneck.....	“ .70

## THE PERFECT-CONTROL AUTOMATIC TORCH.

Patented.



No. 2213 ..... each, \$7.50

## ALCOHOL BLOW LAMP.



The inside arrangement of the tube permits one to place the lamp at any inclination, and to direct the flame toward the positions most difficult to solder, without danger of accident.

No.	Height.	Diameter.	Diameter of Cup.		Each.
2221	5 $\frac{1}{4}$	2 $\frac{3}{8}$	2 $\frac{3}{8}$	Will burn one filling 20 minutes	\$2.25
2222	5 $\frac{3}{4}$	3 $\frac{1}{8}$	2 $\frac{3}{4}$	" " " " 35 "	3.50
2223	6 $\frac{1}{4}$	3 $\frac{1}{2}$	3	" " " " 45 "	3.75
2224	6 $\frac{1}{2}$	3 $\frac{1}{2}$	3 $\frac{3}{8}$	" " " " 60 "	4.00

## SOLDERING LAMP.

For Incandescent Work.



No. 2228. Tin ..... each, \$0.35  
 Brass ..... " .75

## BLOW-PIPE.

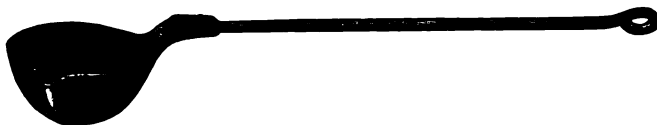


No. 2231. 9-inch, with ball ..... each, \$0.25

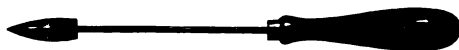
**GAS-JET FORGE.**

This is a convenient fixture for heating soldering coppers, and can be used on any ordinary gas jet. It has a "mixer" and gives a blue flame, making an intense heat. Sometimes used in preference to gasoline or charcoal soldering furnaces where a forge is needed only occasionally.

No. 2216 ..... each, \$3.50

**SOLDER LADLE.**

No. 2432. Length of handle, 5 inches ..... each, \$0.60

**JEWELER'S SOLDERING COPPER.**

No. 2208. 9 inches long ..... each, \$0.50

**LINEMEN'S TORCH.**

No. 2234. Tin ..... each, \$1.70  
 " 2235. Brass ..... " 2.40



## WESTON'S "DIRECT" DIFFERENTIAL PULLEY BLOCKS.

One man can lift 1,000 pounds. They hold the load at any point, and will not run down. Lifting and lowering effected by pulling opposite sides of the slack chain.

PRICE LIST OF DIRECT BLOCKS.

Trade No.	Capacity.	Hoist. Feet.	CHAINS.		Net Weight Complete.	Blocks per Set, Boxed.
			Regular Chain.	Extra Chain, per Foot.		
1821	$\frac{1}{8}$ Ton	5	18 feet	\$0.35	11 lbs.	\$10.00
1822	$\frac{1}{4}$ "	6	22 "	.36	22 "	13.00
1823	$\frac{3}{8}$ "	7	26 "	.38	30 "	15.00
1824	1 "	8	30 "	.40	51 "	20.00
1825	$1\frac{1}{2}$ "	$8\frac{1}{2}$	33 "	.42	81 "	25.00
1826	2 "	9	36 "	.44	122 "	30.00
1827	3 "	$9\frac{1}{2}$	38 "	.48	173 "	40.00

Extra Length of Chains.—Allow about four feet of chain for each extra foot of hoist.

## WESTON'S "GEARED" DIFFERENTIAL PULLEY BLOCKS.

One man can lift from 2,000 to 5,000 pounds. They hold the load at any point, and will not run down. Easy and smooth in action. Light and convenient to handle.

PRICE LIST OF GEARED BLOCKS.

Trade No.	Capacity.	Hoist. Feet.	CHAINS.			Net Weight Complete.	Blocks per Set, Boxed.
			Regular Lengths.		Extra Main Chain, per Foot.		
			Main Chain.	Hand Chain.			
1828	1 Ton	8	22 feet	16 feet	\$ .40	62 lbs.	\$ 35.00
1829	2 “	9	24 “	18 “	.44	109 “	45.00
1830	3 “	10	26 “	20 “	.48	159 “	60.00
1831	4 “	11	28 “	22 “	.54	257 “	80.00
1832	5 “	12	30 “	24 “	.60	324 “	110.00
1833	6 “	13	32 “	26 “	.70	493 “	150.00
1834	8 “	14	36 “	28 “	.85	735 “	210.00
1835	10 “	16	40 “	30 “	1.00	1054 “	270.00

Extra Length of Chains.—For each foot of extra hoist, allow  $2\frac{1}{2}$  feet of main chain, and 2 feet of hand chain. Extra hand chain, \$.38 per foot.

## WESTON'S TRIPLEX SPUR-GEAR BLOCKS.

One Man Can Lift 2,000 Pounds.



All of the mechanism is symmetrically grouped upon a single horizontal axis, and is so arranged as to occupy as little vertical space as possible, thus obtaining the maximum height of hoist. Power is applied to an endless hand-chain, passing over the pocketed chain-wheel on one end of the central shaft, and is transmitted thereby to the train or spur-gearing contained in the housing on the other side of the block. The main or load chain passes over a pocketed chain-sheave in the center of the block, one of its ends being provided with a suitable hook for receiving the load, and the other being looped up and permanently secured to the frame of the block. The latter arrangement diminishes the length of the slack chain, prevents it from fouling, and adds much to the convenience of the block. With this block large pieces of machinery and heavy parts of dynamos, etc., can easily be handled by one man.

PRICE LIST OF TRIPLEX BLOCKS.

Trade Number.	Capacity. Tons.	Regular Hoist. Feet.	Extra Hoist. Per Foot.	Net Weight. Complete.	Complete with Regular Hoist, Boxed.
1836	$\frac{1}{2}$	8	\$1.25	55 lbs.	\$48.00
1837	1	8	1.50	90 "	64.00
1838	$1\frac{1}{2}$	8	1.75	120 "	80.00
1839	2	9	2.00	150 "	96.00



## LITTLE GIANT JACK SCREW.

No. 1799. Height when screwed down, 10 in.

Total rise of screw..... $4\frac{1}{2}$  "

Diameter of screw..... $1\frac{1}{2}$  "

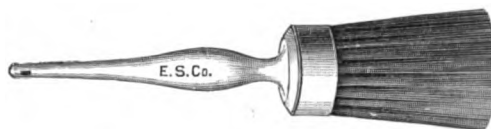
Each.....\$4.50

## PINCH BAR.

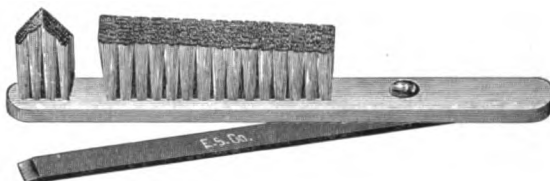


This bar is particularly useful in moving heavy machinery.

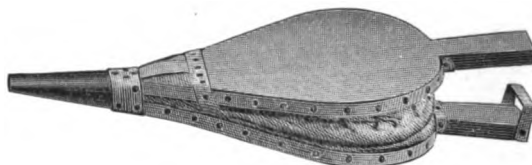
No. 1800. 1 inch diameter, 30 inches long.....each, \$1.40

**GLOBE AND DYNAMO BRUSH.**

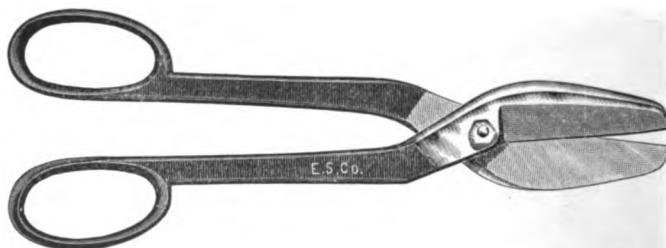
No. 2190 .....each, \$0.60

**CARBON ROD BRUSH.**

No. 2197 .....each, \$0.55

**ARMATURE BELLOWS.**

No. 2180.	8 inches	.....	each, \$ .85
	10 "	.....	" 1.00
	12 "	.....	" 1.20

**COMMUTATOR BRUSH SNIPS.**

No. 1690.	14 inches long, cut 4 inches	.....	each, \$2.75
	8 " " " 2 1/2 "	.....	" 1.50

**COMMUTATOR BRUSH SHEARS.**

No. 1700. 8 inches long .....each, \$1.50

## OIL SYRINGE.

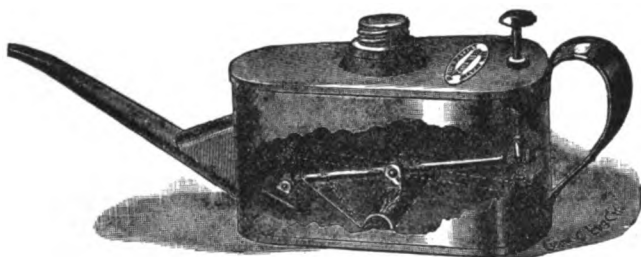


For withdrawing oil from waste oil cups on dynamos and engines.

No. 3500.....each, \$2.60

## THE PERFECTION OIL CAN.

FILLER.



It will perform the same work as other oilers in one-third the time, and with a great saving of oil.

No. 3477.	1 pint can, tin.....	each, \$1.00
" 3477B.	1 " brass.....	" 1.50
" 3478.	1 quart can, tin.....	" 1.25
" 3478B.	1 " brass.....	" 1.60

## THE PERFECTION OIL CAN.

UPRIGHT.



No. 3479.	1 pint can, tin.....	each, \$1.00
" 3479B.	1 " brass.....	" 1.50
" 3480.	1 quart can, tin.....	" 1.25
" 3480B.	1 " brass.....	" 1.60

## ENGINEERS DRIP OILER.

No. 3488. 1½ pint, 7-in. spout each, \$0.50

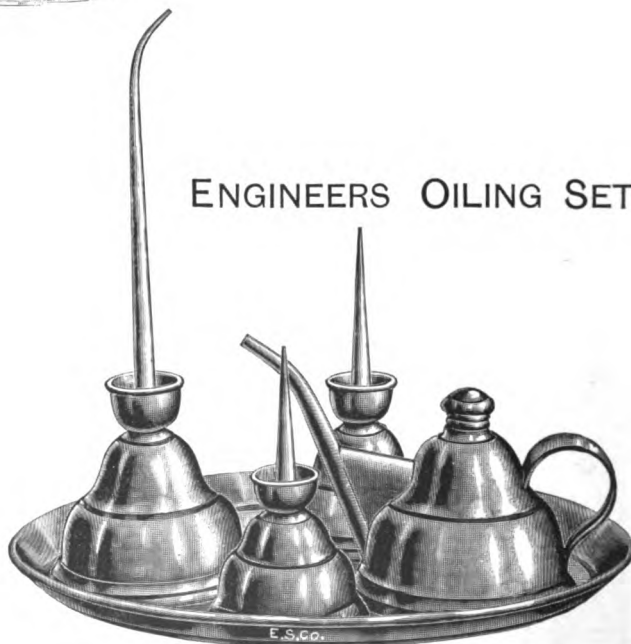


## ENGINEERS TORCH.

No. 3489. 14 in., brass.....each, \$2.00



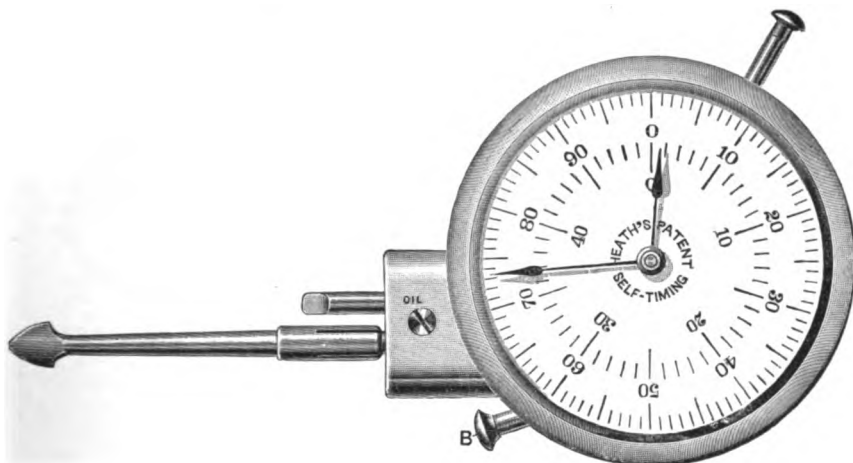
## ENGINEERS OILING SETS.



No. 3490.	Brass, small.....	per set, 4 pieces, \$	7.00
" 3490N.	Nickel-plated, small.....	" 4 "	9.00
" 3491.	Brass, large.....	" 5 "	8.00
" 3491N.	Nickel-plated, large.....	" 5 "	10.00

## HEATH'S SPEED INDICATOR.

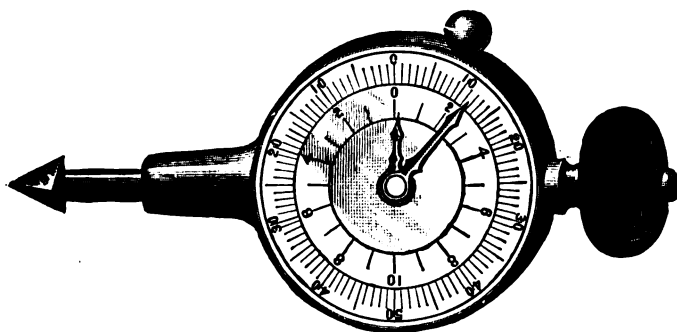
Self-Timing and Self-Registering.



Is provided with a half-minute time movement, which is started by pressing upon a spring after the point has engaged with the shaft; at the expiration of a half minute the hands stop, leaving a full minute record on the dial.

No. 2269 ..... each, \$25.00  
 Long Pointer, necessary in most dynamo work ..... " 2.00

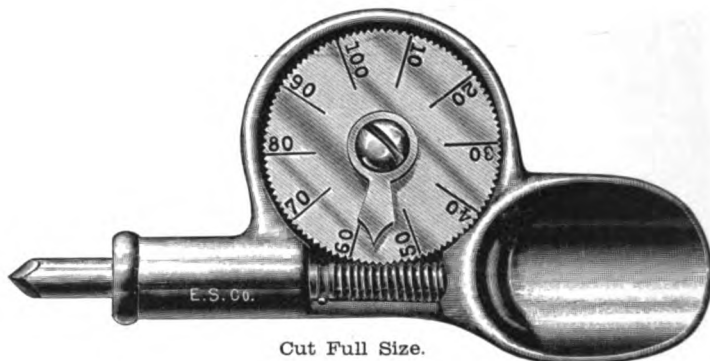
## DYNAMO SPEED INDICATOR.



This Indicator, when placed in contact with the shaft, revolves without registering until the mechanism is connected by the stud on the side, thereby saving time and assuring accuracy. Nickel-plated, with ebony handle.

No. 2277 ..... each, \$7.50

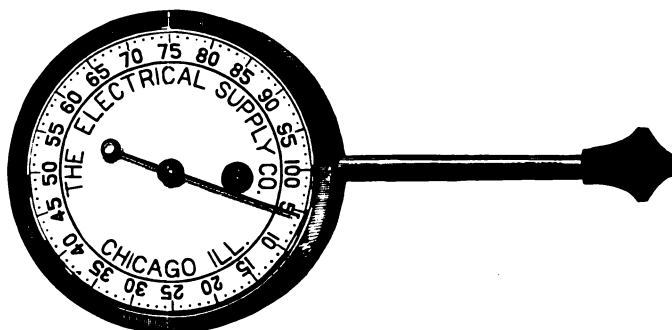
## COMMON SPEED INDICATOR.



Cut Full Size.

No. 2275 ..... each, \$1.00

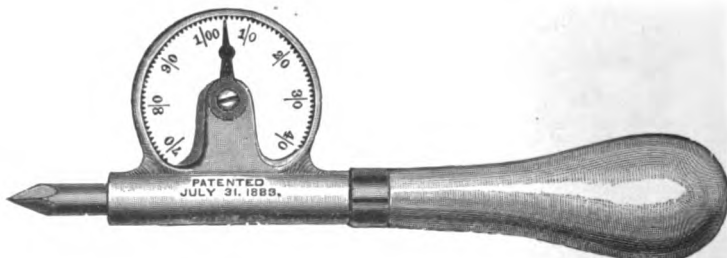
## "LIGHTNING" SPEED INDICATOR.



Registers as high as 1,000, as seen by the cut, which is actual size. The body constitutes the handle. Has a rubber tip on the spindle, a silver-plated dial, and face covered with a watch crystal. Will stand over 10,000 rotations per minute. Satisfaction guaranteed.

No. 2273 ..... each, \$2.00

## FOWLER DYNAMO SPEED INDICATOR.

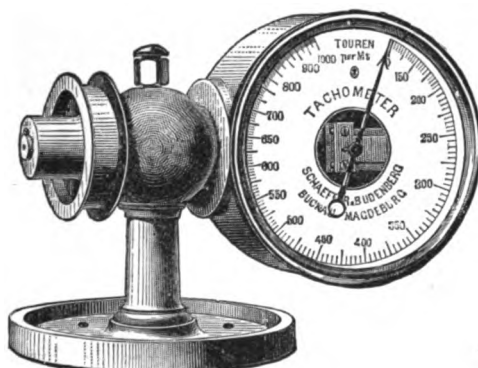


Simple, accurate, and compact. Indicates 5,000 revolutions either right or left.  
 No. 2278 ..... each, \$2.50  
 Extra points ..... " .75

## TACHOMETERS.

There are many cases when the use of a Tachometer is essential in making electrical tests. These instruments have suffered somewhat from the introduction of inferior apparatus, of which a considerable number has been sold, and which have failed to give complete satisfaction. The instruments which we offer have been proved by several years of use, and have invariably been found to wear well and to give perfect satisfaction. The great advantage of a Tachometer over a speed counter is that it will show variations of a momentary nature, which fail to appear at all in the record of a speed counter. Steady power is the most important factor in securing good electrical results, and but little can be learned regarding the power without the use of a good Tachometer.

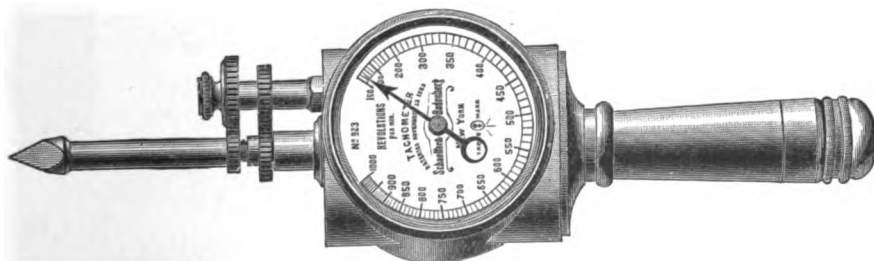
### STATIONARY TACHOMETER.



**Especially adapted for electric dynamos and high-speed engines**

- |           |  |               |
|-----------|--|---------------|
| No. 2266. | Large size, with dial of $7\frac{1}{4}$ inches diameter..... | each, \$60.00 |
| " 2267.   | Small " " " " $5\frac{1}{4}$ " " .....                       | " 55.00       |

### PORTABLE TACHOMETER.



**Adapted for electric dynamos, high-speed engines, etc.**

- |               |               |
|---------------|---------------|
| No. 2268..... | each, \$60.00 |
|---------------|---------------|

## CARBON CASES.



No. 2311. Heavy tin, made  
with concave side  
to fit the body.  
Each ..... \$2.00

Capacity about 100 carbons,  $\frac{1}{8}$  inch.



No. 2316. All leather, with  
shoulder straps.  
Each ..... \$3.00

Capacity 100 carbons,  $\frac{1}{8}$  inch.

## RUBBER GLOVES.

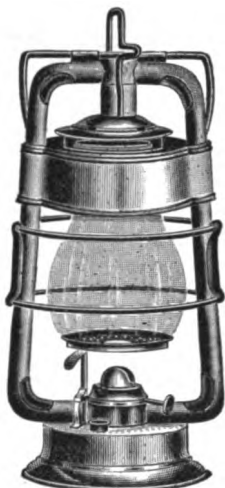


Sizes Nos. 10, 11, and 12 in stock. State  
size wanted when ordering. *There is a differ-  
ence of three numbers between the same size of  
rubber and kid gloves.* No. 10 rubber glove  
corresponds to No. 7 kid.



No. 2331. With wrists, per pair ..... \$2.00  
“ 2333. Without wrists, per pair ..... 1.50

## INSPECTORS LANTERN.



Will not extinguish in rain or wind storms.

No. 2336. Tin ..... each, \$1.00

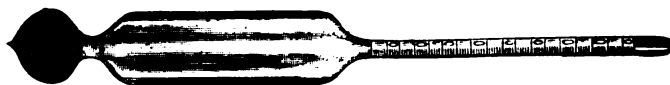
## LAMP-TENDERS DARK EYE-GLASSES.



No. 2340 ..... per pair, \$0.75

## HYDROMETER.

For Storage Battery Work.



This is an excellent and reliable Hydrometer, made thin so that it may be readily inserted between plates in storage batteries to test the specific gravity of the solution.

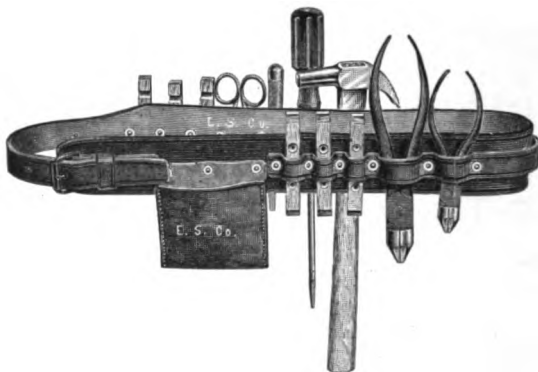
No. 3081 ..... each, \$1.50

## LINEMEN'S TOOL BAG.



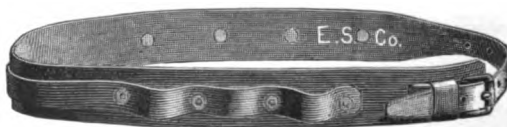
No. 2303. Canvas, with handles.....each, \$5.00

## WIREMEN'S TOOL BELT.



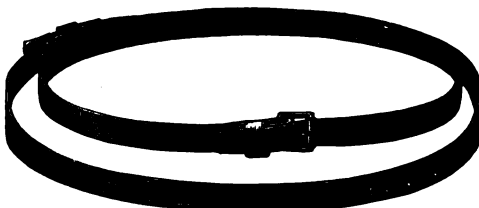
No. 2302. Best Leather, without tools .....each, \$1.00

## LINEMEN'S TOOL BELT.



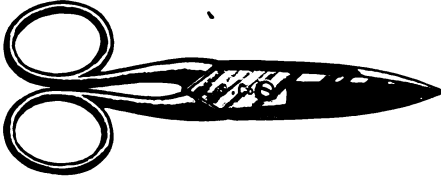
No. 2307. Best Leather.....each, \$1.00

## LINEMEN'S SAFETY BELT.



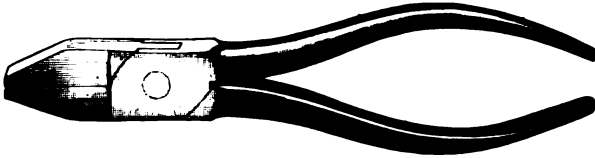
No. 2309. Best Leather.....each, \$1.50

## ELECTRICIANS SCISSORS.



No. 1710. Full length  $5\frac{1}{4}$  in. Length of blade  $1\frac{1}{4}$  in. .... each, \$1.20

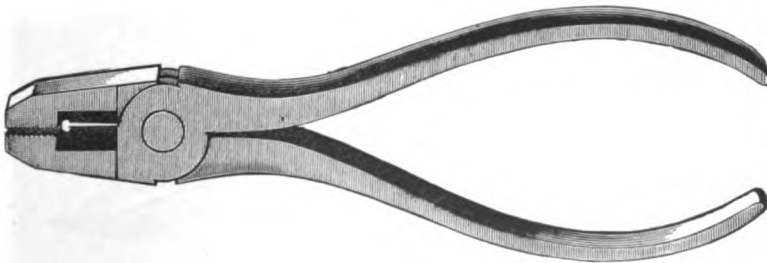
## STUBS GENUINE SIDE-CUTTING PLIERS.



No. 1570.

Size .....	inches,	$4\frac{1}{2}$	5	6	7	8	9
Plain, per pair .....		\$ .85	.85	.90	1.50	2.00	3.00
Nickel-plated, per pair .....		1.35	1.40	1.50	2.00	2.50	3.50

## HALL'S PATENT WIRE PLIERS.



No. 1582.

Size .....	inches,	4	5	6	8
Plain, per pair .....		\$ .60	.65	.75	1.10
Nickel-plated, per pair .....		1.10	1.15	1.25	1.60

## DIAGONAL NIPPERS.

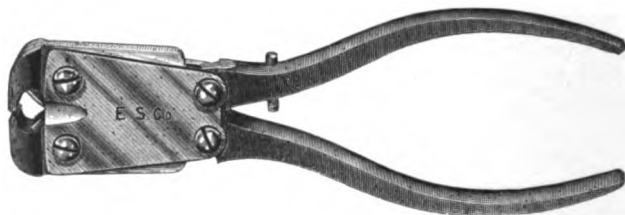


No. 1690.

Knives placed at 45 degrees from handle, which permits cutting flush with surface.

Size, 5 inch, plain	.....	each, \$ .80.	Nickel-plated, \$1.30
" 6 " "	.....	" 1.00.	" " 1.50

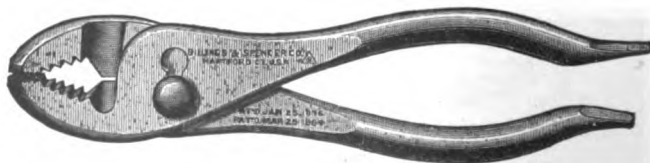
## HALL'S CUTTING NIPPERS.



No. 1660.

Size, 5 inch, cuts $\frac{3}{8}$ inch wire, plain	.....	each, \$1.20.	Nickel-plated, \$1.60
" 7 " " $\frac{1}{8}$ " " " "	.....	" 1.85.	" " 2.25

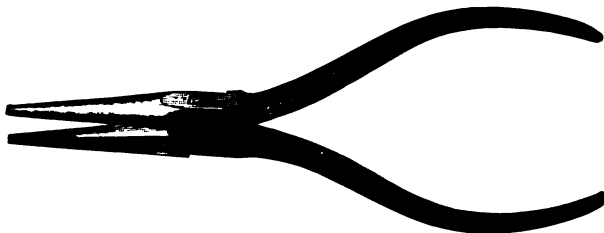
## COMBINATION PLIERS.



No. 1620. 6 inch	.....	each, \$1.60
------------------	-------	--------------

## LONG NOSE PLIERS.

Flat.

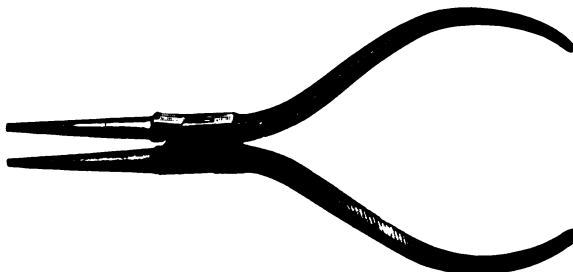


No. 1630.

Size .....	inches,	4	5	6
Each .....		\$0.45	.50	.60

## LONG NOSE PLIERS.

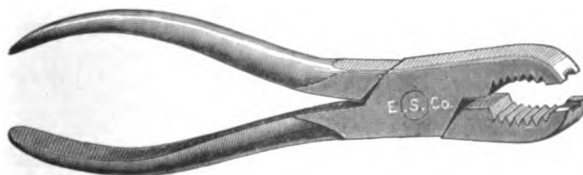
Round.



No. 1631.

Size .....	inches,	4	5	6
Each .....		\$0.45	.50	.60

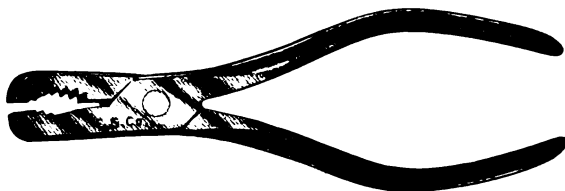
## CARBON PLIERS.



No. 1640. 6 inch ..... each, \$0.40

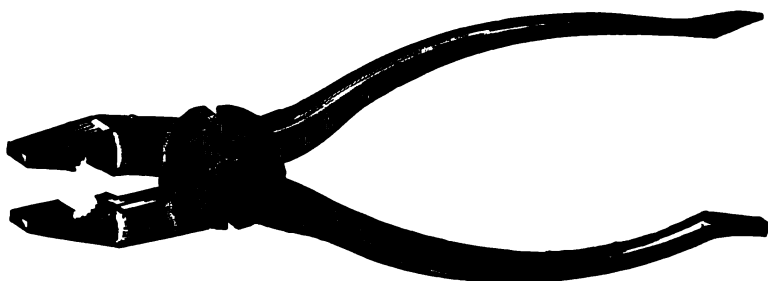
## FIXTURE PLIERS.

Polished Steel. Warranted.



No. 1634. 6 inch ..... each, \$0.60

## THE UNIVERSAL PLIERS.



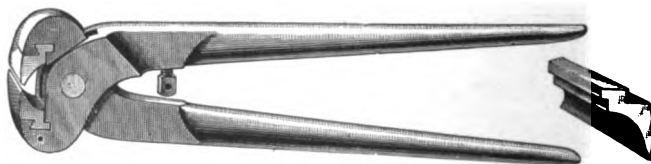
No. 1583

This combines Screw-driver, Cutting Pliers, and Carbon or Pipe Pliers. Guaranteed all steel, and especially imported.

8 inch, Plain ..... each, \$1.50. Nickel-plated, \$2.00

## CAREW'S PATENT WIRE CUTTERS.

Made Throughout of Forged Steel.



No. 1670.

Adjustable jaws. When the edges need grinding, the jaws may be driven out, sharpened, and replaced, or replaced with new jaws.

Size .....	8	10
Price .....	each, \$2.65	\$3.00
Extra Jaws .....	per pair, .70	.90

## TWEEZERS.



No. 1650.

4 inch ..... each, \$0.10  
 6 " ..... " .22

## NOVELTY BELL HANGER'S KNIFE.



A pull of the thumb upon the thumb-piece, in the ordinary position in which the knife is held for use, opens the blade-slot, and drops out and securely locks the blade.

No. 2107. Length when open,  $5\frac{1}{2}$  inches ..... each, \$0.50

## CLARK'S IMPROVED SCREW-DRIVER HANDLE AND SET OF BITS.



No. 2091. In maple boxes, with four Bits to each set ..... each, \$1.85  
 " 2091B. In paper " " three " " " ..... " 1.10

## PLAIN SCREW-DRIVER.



No. 2090.	Size.....inch,	4	6	8	10
	Price.....each,	\$0.20	.24	.35	.50

## CHAMPION SCREW-DRIVER.



No. 2101.	Size.....inch,	2½	4	6	8	10	12
	Price.....each,	\$0.32	.42	.60	.80	1.00	1.20

## GAY'S RACHET SCREW-DRIVER.



No. 2095.	Size.....inch,	6	8	10	12
	Price.....each,	\$1.00	1.15	1.25	1.40

## NOVELTY POCKET SCREW-DRIVER.



This Screw-driver possesses the valuable feature of being both a pocket and practical tool. By holding it down and pressing the joint on the end, the Screw-driver falls out to its full length. By reversing the operation it becomes encased in the handle.

No. 2106.....	each,	\$0.50
---------------	-------	--------

## VULCAN INSULATED SCREW-DRIVER.



This handle may be safely used in connection with electric lights of high potential.

No. 2096. Size,  $2\frac{1}{2}$  inch.....each, \$0.60

## INSPECTORS SCREW-DRIVER.

All steel. Hollow handle.



No. 2097. Length of blade,  $2\frac{1}{2}$  inches; whole length,  $5\frac{1}{2}$  inches....each, \$0.50

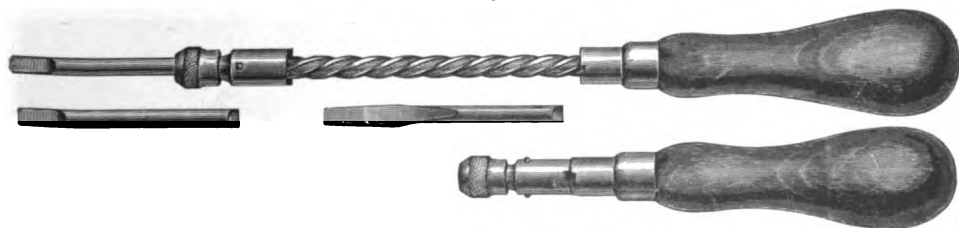
## INSTRUMENT SCREW-DRIVER.



No. 2099. 4 inch.....each, \$0.40

## GOODELL AUTOMATIC SCREW-DRIVER.

Patented July 22, 1890.



No. 2098. Complete, with 3 bits.....each, \$2.00

## EUREKA LIGHTNING SCREW-DRIVER.



For light boring and screw-driving. Is quick in action, and as the power is applied on the top, it may be used with great force. It may be used either automatically, running the bit both back and forward, or to turn the bit one way only, as is necessary to drive a screw or bore a hole with an auger bit.

No. 2037.....each, \$2.40

## HANDY RATCHET SCREW-DRIVER.

Patented Sept. 30, 1890.



No. 2094.

Reversible, to turn right or left (in or out) by a single motion of the finger on the projecting pawl, without removing the blade from the screw or changing the position of the hand on the tool.

For rapidity, ease, and convenience of operation, it has no equal.

Blade .....	inches,	4	6
Price .....	each,	\$0.70	.90

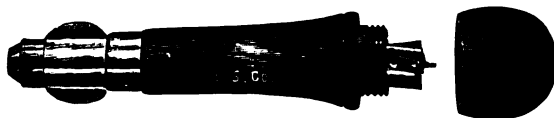
## PERFECTION TOOL HANDLE.



These handles are especially convenient, as the small tools are always in sight when the cap is removed, which obviates the necessity of pouring them out and sorting. The handle is solid, and will permit hammering like an ordinary awl.

No. 2282.....each, \$1.00

## FRAY'S TOOL HANDLE.



This set of tools is of the best quality, and a good serviceable size. The set contains 9 tools.

No. 2283.....each, \$1.80

## AMERICAN STANDARD WIRE GAUGE.

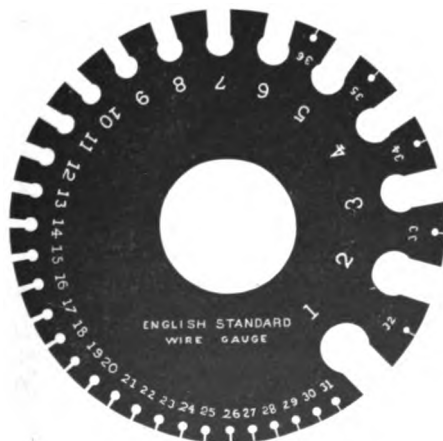
BROWN & SHARPE'S.



All of our wires are listed by this gauge unless specified to the contrary.

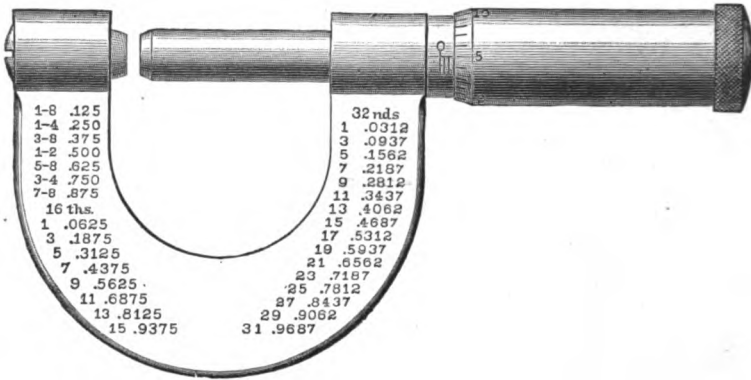
No. 1501.	Sizes 5 to 36.....	each, \$3.30
" 1502.	" 0 to 36.....	" 4.65

## BIRMINGHAM OR STUBS WIRE GAUGE.



No. 1504.	Sizes 1 to 36.....	each, \$2.65
-----------	--------------------	--------------

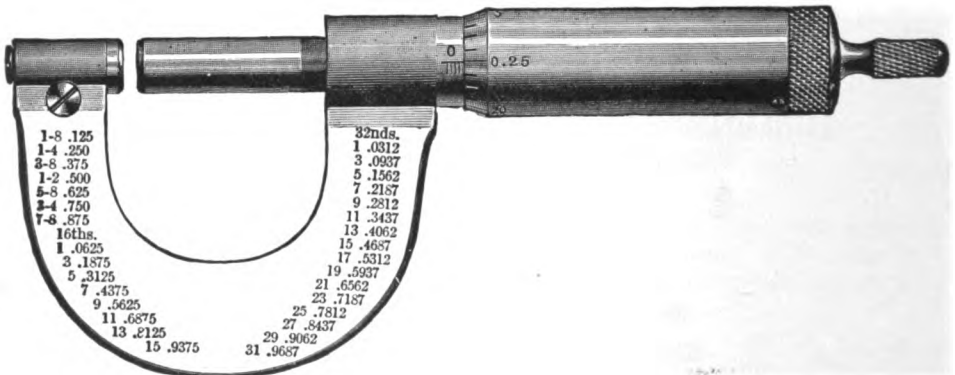
## MICROMETER CALIPER.



Measures from .001 to 1 inch.

No. 1509 ..... each, \$6.75  
 " 1509M. With Morocco Case ..... " 8.00

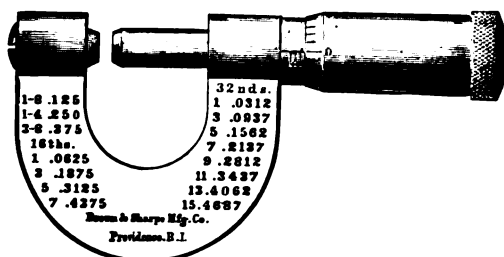
## SPEEDED SCREW MICROMETER.



Made with a knurled thumb-piece on the end of spindle, which enables more rapid and accurate adjustment than in the ordinary instruments. It is so constructed as to be unnecessary to split the threaded barrel to contract it, and there is no opening for dirt to get to the screw or nut to clog and cause inaccuracy of adjustment. The anvil and spindle are of same size, which permits of calipering small flanges, projections, etc. Every Micrometer warranted correct.

No. 1510 ..... each, \$8.00  
 " 1510M. With Morocco Case ..... " 9.00

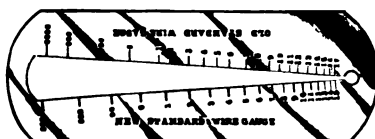
## MICROMETER CALIPER.



To measure from .001 to .5 inch.

No. 1507.....each, \$8.00  
 " 1507M. With Morocco Case....." 6.65

## POCKET SCREW AND WIRE GAUGES.



On one side is a gauge for all sizes of screws, and a rule for measuring the length of screws. The other side gauges all sizes of wire, by both American and English Gauge, from 0000 to 17.

No. 1506.....each, \$3.30

## ROLLING MILL GAUGES.

Birmingham Sizes.

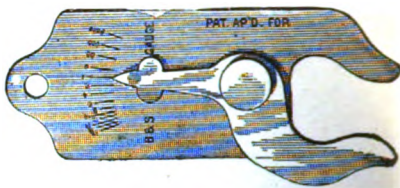


No. 1511. Sizes 000 to 25.....each, \$3.30  
 " 1512. " 1 " 32....." 4.00

## SELF-REGISTERING WIRE GAUGE.

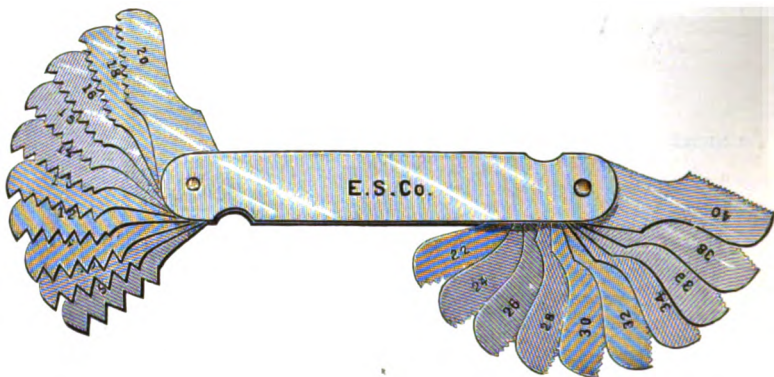
Scale guaranteed to be accurate. Made of polished steel.

No. 1515 ..... each, \$0.60



Exact Size of Gauge.

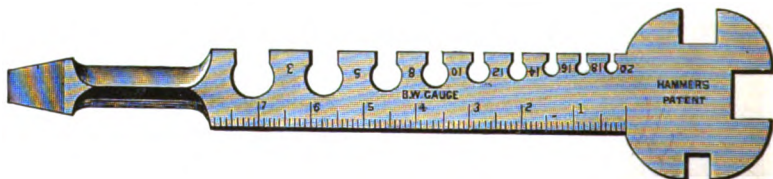
## PATENT SCREW THREAD GAUGE.



May be used both inside and outside on screw threads for determining the number of threads to the inch.

No. 1513 ..... each, \$1.30

## ELECTRICIANS POCKET TOOL.



Made of the best tool steel, nickel-plated, and of the finest workmanship. Comprises accurate Wire Gauge, either American (B. & S.) or Birmingham, French Millimeter and English Inch comparative Scales, Screw-Driver, Wire Cleaner or Pencil Sharpener, and Standard Wrenches. *In a neat case for the Vest Pocket.*

No. 1514. American or B. & S. Gauge ..... each, \$4.00

" 1514 B. Birmingham Gauge ..... " 4.00



## POLE COUNTER.

For counting poles, broken insulations, making tallies of materials, etc. Two inches in diameter, weighs about four ounces. Carried in the hand, each pressure records one, which is shown on the dial.

No. 1564 ..... each, \$3.00



1557.

## CHESTERMAN'S TAPE LINES.

### LINEN.

25 feet	.....	each, \$1.85
50 "	.....	" 2.75
100 "	.....	" 4.25

### STEEL.

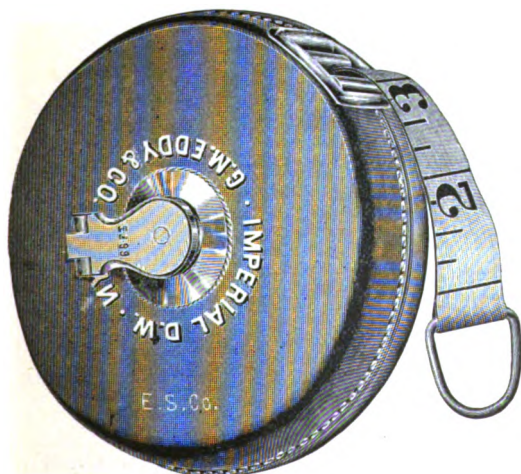
6 feet (pocket size),	each, \$2.75
25 "	..... " 6.00
50 "	..... " 9.60
100 "	..... " 17.00



1559.

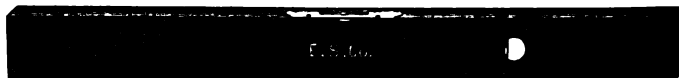
## HOLLAND TAPES.

25 feet	.....	each, \$ .40
50 "	.....	" .65
100 "	.....	" 1.10



1561.

## LEVEL.



No. 1566. 26 inches ..... each, \$0.90

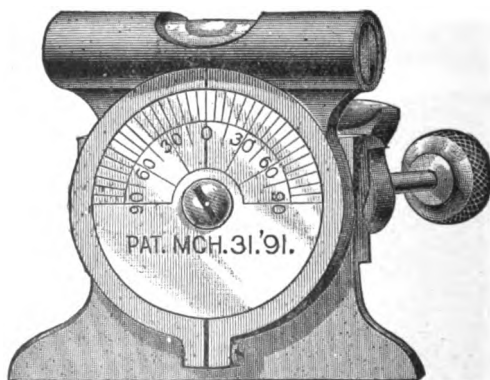
## ADJUSTABLE IRON LEVEL.



No. 1567. 12 inches ..... each, \$3.00

## UNIQUE POCKET LEVEL.

Patented March 31, 1891.



Designed for use as an independent tool or in connection with a steel or wood rule, straight edge, try-square, or bevel, or for determining the boring angle of an auger bit or drill.

No. 1568. Brass ..... each, \$ .75  
 " 1568N. Nickel-plated ..... " 1.00

**ADZ-EYE NAIL HAMMER.**

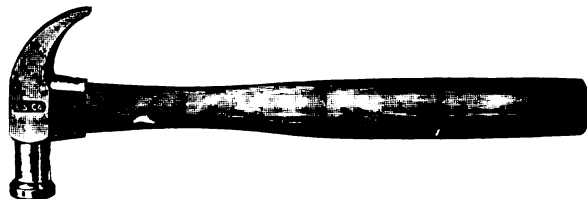
Plain Face.



No. 1933.	Weight.....	1 lb.	1 1/4 lbs.
	Price.....	each, \$0.60	.70

**ADZ-EYE NAIL HAMMER.**

Bell Face.



No. 1935.	Weight.....	1 lb.	1 lb. 3 oz.
	Price.....	each, \$0.60	.70

**ELECTRICIANS HAMMER.**

Small Nose.



No. 1930.	Weight.....	8 oz.
	Price.....	each, \$0.60

**PLAIN-EYE RIVETING HAMMER.**

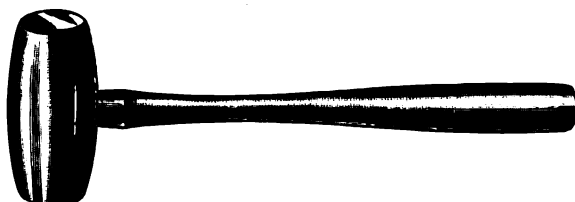
No. 1937.	Weight.....	13 oz.	1 lb. 2 oz.	1 lb. 8 oz.
	Price.....	each, \$0.40	.45	.55

## MACHINISTS PEIN HAMMER.



No. 1939.	Weight.....	1 lb.	1 lb. 4 oz.	1 lb. 8 oz.
	Price.....	each, \$0.85	.90	1.00

## COPPER HAMMER.



This should be used in work around Engines or Dynamos, where a steel hammer will be found too hard.

No. 1940.	Weight.....	2 lbs.	2½ lbs.	3 lbs.
	Price.....	each, \$1.50	1.75	2.00

## LINEMEN'S BROAD HATCHET.

Solid Cast Steel. Fully Warranted.



No. 1941.	Length of cut.....	inches, 6	7½
	Price.....	each, \$1.40	1.90

## LINEMEN'S LIGHT HATCHET.

Solid Cast Steel.



No. 1945.	Length of cut.....inches,	$3\frac{1}{2}$	4	$4\frac{1}{2}$
	Price.....each,	\$0.80	.90	1.00

## CLAW HATCHET.

Solid Cast Steel.



No. 1947.	Length of cut.....inches,	$3\frac{1}{2}$	4	$4\frac{1}{2}$
	Price.....each,	\$0.90	1.00	1.10

## LINEMEN'S AXE.



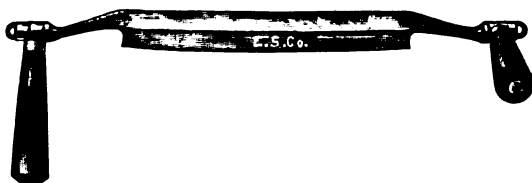
No. 1949.	Without Handle.....	each,	\$0.85
	Axe Handle only.....	"	.40

## DRAWING KNIFE.



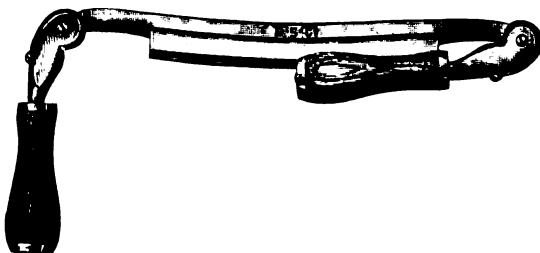
No. 1960. Length of blade ..... inches, 10 12  
 Price ..... each, \$1.40 1.60

## ADJUSTABLE DRAWING KNIFE.



No. 1961. Length of blade ..... inches, 10 12  
 Price ..... each, \$1.70 2.00

## FOLDING HANDLE DRAWING KNIFE.



No. 1962. Length of blade ..... inches, 8  
 Price ..... each, \$2.40

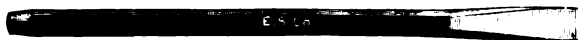
## HEAVY GAINING CHISEL.

Best Cast Steel.



No. 1970. Size ..... inches,  $\frac{3}{4}$  1  $1\frac{1}{2}$  2  
 Price ..... each, \$0.60 .75 .90 1.15

## COLD CHISEL.



Eight inches long, and wider at the bit than on the shank, consequently will not bind when used for drilling.

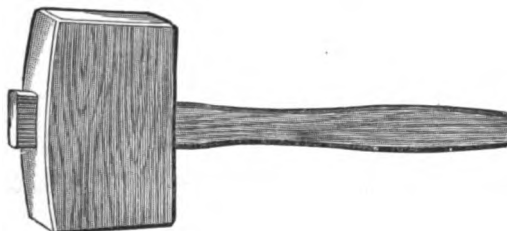
No. 1983.	Size of shank.....inch,	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
	Price.....each,	\$0.17	.24	.40	.46	.66	.83

## FIBRE-HEAD MALLET.



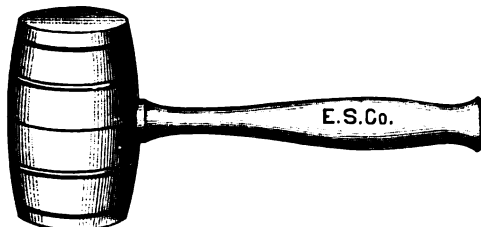
No. 1984.	Diameter.....inches,	2	$2\frac{1}{2}$	3
	Price.....each,	\$0.80	.95	1.15

## LIGNUM-VITÆ MALLET.



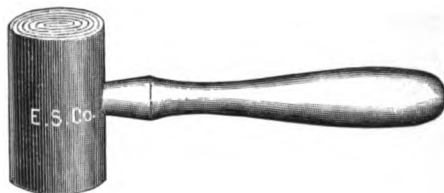
No. 1986.	$2\frac{1}{2} \times 3\frac{1}{2} \times 6$ inches	.....each,	\$0.45
	$2\frac{3}{4} \times 3\frac{1}{4} \times 6\frac{1}{2}$ "	....."	.55
	$3 \times 4 \times 7$ inches	....."	.65

## HICKORY MALLET.



No. 1985.	$5\frac{1}{2} \times 3\frac{1}{2}$ .....	each,	\$0.30
-----------	--	-------	--------

## RAWHIDE MALLET.



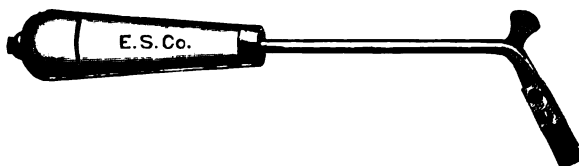
Number.	Diameter.	Length.	Weight.	Each.
2292	1½ inch.	3 inch.	6 ounces.	\$ .40
2294	2 "	3½ "	10 "	.60
2296	2¾ "	5 "	24 "	1.50

## FLOOR GROOVERS.

With Removable Knife.



No. 1688.....each, \$1.00  
 Extra Knives....." .60



Combined Floor Groover and Sinker. Made especially for us, and an improvement over any other. The blades are of best steel, are removable, and will cut a deep, narrow groove which will hold small wire almost without staples.

No. 1685.....each, \$2.00  
 Extra Knives....." .60

## LINEMEN'S SAW.



No. 1998 .....	inches,	16	18	20
Price .....	each,	\$1.30	1.45	1.55

## EUREKA KEY-HOLE SAW.



The teeth turn backward and cut only as the saw is pulled out. By this means all danger of breaking the saw blade is avoided. The blade is also drawn firmly into the handle when not in use, making it a compact and convenient tool for electricians' satchels.

No. 2005.	Handle, with one blade .....	each,	\$0.50
	Extra Saw Blades .....	"	.25

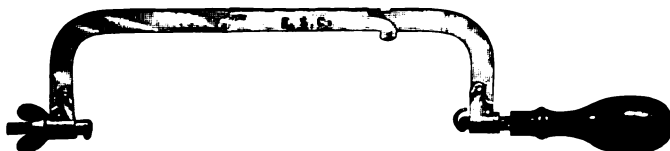
## KEY-HOLE SAW AND PAD.



No. 2006.	Complete .....	each,	\$0.40
	Extra Blades .....	"	.20

## HACK SAW.

With Extension Frame.



No. 2000.	Frame, without blades .....	each,	\$1.30
-----------	-----------------------------	-------	--------

## HACK SAW BLADES.



No. 2001.	Length of blade ..inches,	6	7	8	9	10	12
	Per doz.....	\$0.80	.85	.90	.95	1.00	1.10

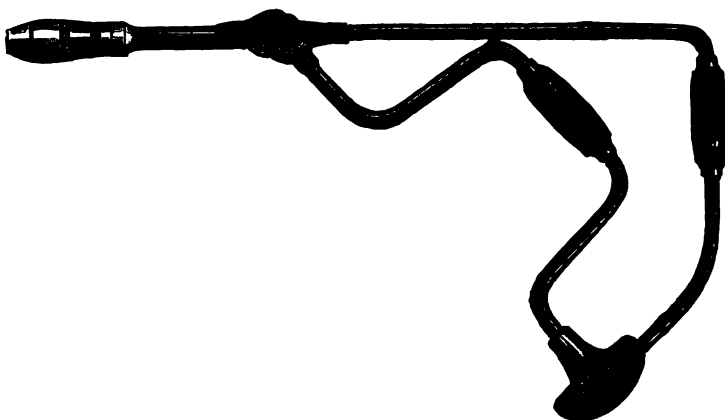
## ADJUSTABLE IRON HANDLE.



For use where the brace is inconvenient. Is adjustable to any size drill.

No. 2077. Japanned, per doz.....\$1.50. Each, \$0.15

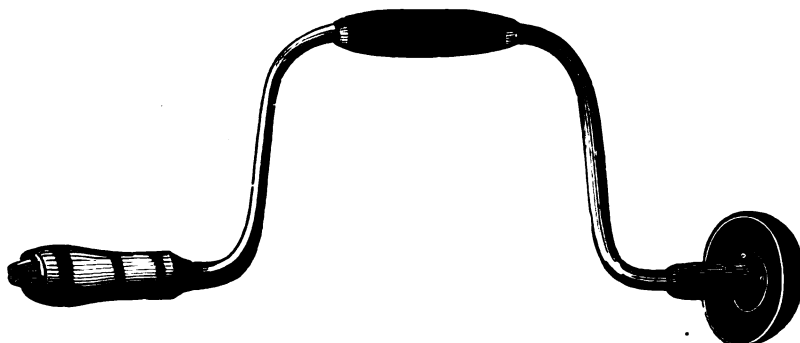
## ANGLE BRACE.



Full Nickel-plate. Steel Rods.

No. 2048. 8-inch sweep.....each, \$3.50

## PLAIN BRACE.



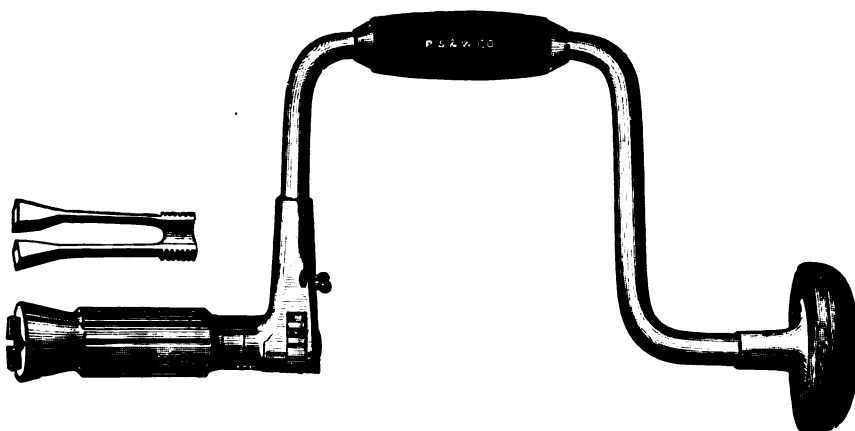
No. 2020. 8 inch sweep ..... each, \$1.25

## RATCHET BRACE.



No. 2030. 8 inch sweep, nickel-plated ..... each, \$2.75  
 10 " " " ..... " 3.00

## IMPROVED RATCHET BRACE.



No. 2032. 8 inch sweep, nickel-plated ..... each, \$2.50  
 10 " " " ..... " 3.00

## JENNINGS AUGER BIT.



No. 2050.	Size...inch,	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
	Each.....	\$0.17	.19	.20	.25	.31	.37	.45

## CLARK'S EXPANSIVE BITS.



No. 2055.	With two cutters, one boring from $\frac{1}{2}$ to $\frac{7}{8}$ , and the other from $\frac{7}{8}$ to $1\frac{1}{2}$ inches.....	each, \$1.80
" 2057.	With two cutters, one boring from $\frac{7}{8}$ to $1\frac{1}{2}$ , and the other from $1\frac{1}{2}$ to 3 inches.....	" 2.70

## GERMAN TWIST BIT.



No. 2052.

A fast boring Bit, made of best steel, with point less liable to break than any other made.

Diameter.	18-INCH.		24-INCH.		30-INCH.	
	Doz.	Each.	Doz.	Each.	Doz.	Each.
$\frac{3}{8}$	\$7.00	\$0.70	\$ 9.00	\$ .90	\$10.00	\$1.00
$\frac{1}{2}$	7.50	.75	9.50	.95	10.50	1.05
$\frac{5}{8}$	8.50	.85	10.50	1.05	11.50	1.15

## SYRACUSE BRACE DRILLS.

For Interior Electric Light Work.



No. 2054.

Will pierce plaster, nails, and brick walls, and can be sharpened when dull.

Diam. 32 in.	12-INCH.		18-INCH.		24-INCH.		30-INCH.		36-INCH.	
	Doz.	Each.	Doz.	Each.	Doz.	Each.	Doz.	Each.	Doz.	Each.
6	\$5.00	\$ .50	\$7.00	\$ .70	\$9.00	\$ .90	\$11.00	\$1.10	\$13.00	\$1.30
8	5.00	.50	7.00	.70	9.00	.90	11.00	1.10	13.00	1.30
10	5.50	.55	7.50	.75	9.50	.95	12.00	1.20	13.00	1.30
12	6.00	.60	8.00	.80	10.00	1.00	12.00	1.20	13.00	1.30
14	7.00	.70	9.00	.90	11.00	1.10	13.00	1.30	14.00	1.40
16	8.00	.80	10.00	1.00	12.00	1.20	14.00	1.40	15.00	1.50
18	9.00	.90	11.00	1.10	13.00	1.30	15.00	1.50	16.00	1.60
20	10.00	1.00	12.00	1.20	14.00	1.40	15.00	1.50	16.00	1.60
22	11.00	1.10	13.00	1.30	15.00	1.50	16.00	1.60	17.00	1.70

## FORSTNER AUGER BIT.

For smooth, round, oval, or square boring, scroll and twist work.



This Bit may be used for almost any kind of boring, and is immensely superior to any other Bit on the market in its adaptability to different classes of work.

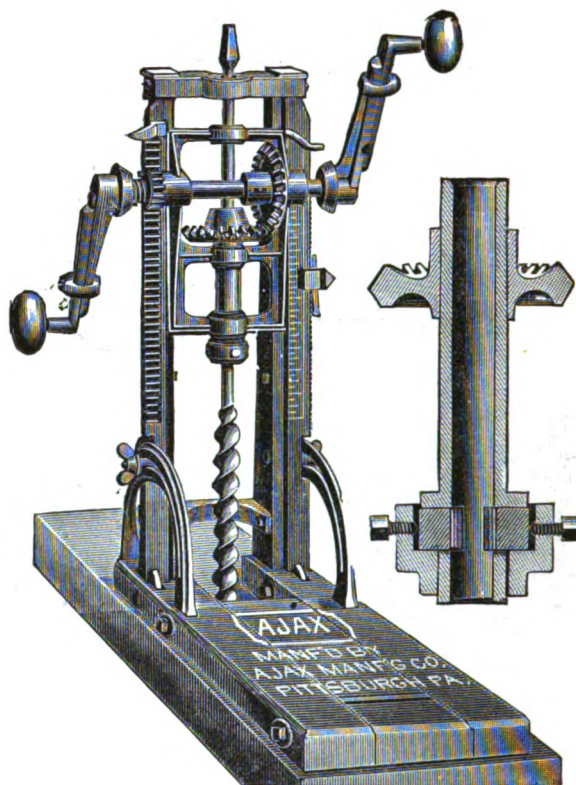
No. 2049.	Size .....	inch,	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$	$\frac{7}{8}$	1
	Price .....	each,	\$0.50	.45	.55	.68	.80	.92	1.05

## BELL HANGERS GIMLETS.



No. 2059.	Size, diameter .....	inch,	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{5}{16}$
	Length 36 inches .....	each,	\$1.00	\$1.00	\$1.20	\$1.20
	" 24 " .....	"	.80	.80	1.00	1.00
	" 15 " .....	"	.60	.60	.80	.80

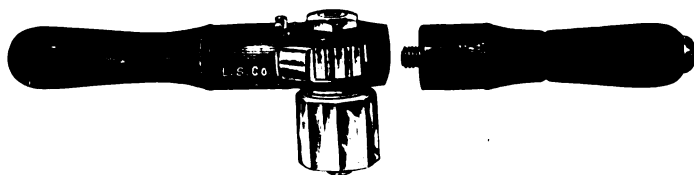
## AJAX BORING MACHINE.



No. 2060. Without Augers.....each, \$7.00

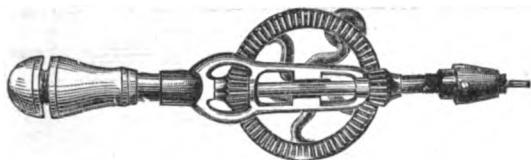
## AUGERS.

For Boring Pin Holes in Cross Arms.



No. 2062.	1 1/4 inch, with Ratchet Handle, complete.....	each, \$5.00
	1 1/2 " " " " " ".....	" 5.25
	Ratchet Auger Handles only.....	" 2.50

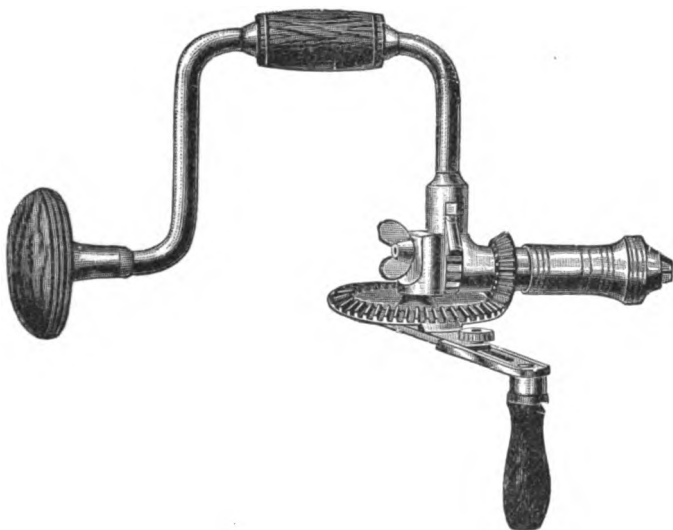
## HAND DRILL.



Provided with hollow handle to hold the drills.

No. 2086. Single gear, with 6 drills and nickel-plated drill chuck . . . each, \$1.50

## DRILL BRACE.



No. 2087. Complete, nickel-plated . . . . . each, \$3.60

## "JUMPER" BRICK DRILL.



This is the best Brick Drill yet devised for drilling a round hole through masonry of any kind. Made of the best steel. Length of drill, 26 inches.

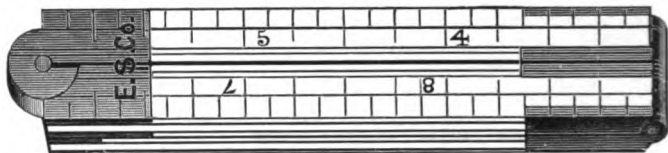
No. 2013. Drill and Handle . . . . . \$2.00

## HOLLOW BRICK DRILL.

As the Drill is hollow, it will hold the dust and dirt, and on that account is preferred for interior work, where it is desired to drop as little dirt as possible.

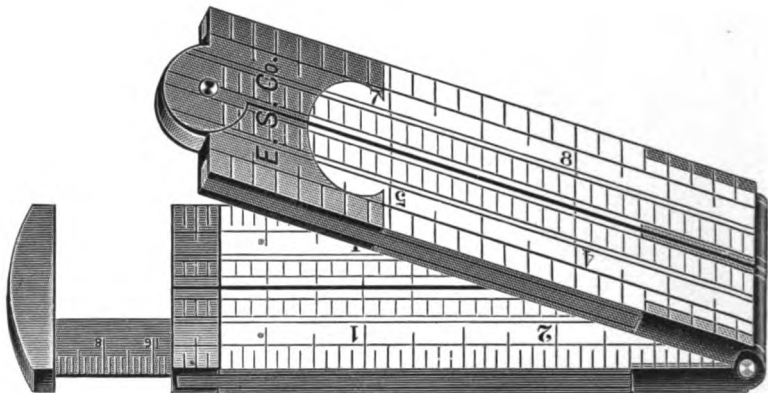
No. 2012 . . . . . each, \$0.80

## BOXWOOD RULES.



- No. 1531. 1 foot, sq. joint, edge plates, 8ths and 16ths,  $\frac{3}{8}$ -in. wide .....\$0.12  
 " 1533. 2 " " " " 8ths, 16ths, 10ths, and scales... .16

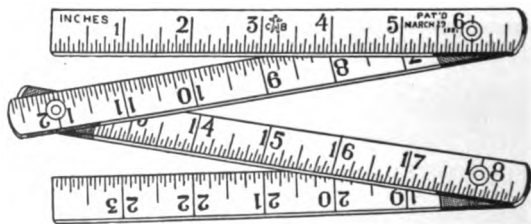
## ENGINEERS CALIPER RULES.



- No. 1535. Boxwood, arch joint, edge plates, four-fold, 12-inch,  $\frac{7}{8}$ -inch wide.....each, \$ .50  
 " 1537. Ivory, arch joint, bound, four-fold, 12-inch,  $\frac{3}{8}$ -inch wide, " 3.50

## ELECTRICIANS POCKET RULES.

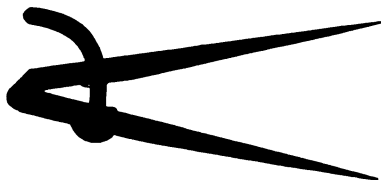
WOOD, WITH SPRINGS.



- No. 1544. 2 foot, four-fold div.  $\frac{1}{8} \times \frac{1}{8}$  inch.....each, \$1.00  
 " 1545. 4 " eight-fold, "  $\frac{1}{8} \times \frac{1}{8}$  " ..... " 1.50  
 " 1546. 4 " " "  $\frac{1}{8}$  x meter ..... " 1.50

These Pocket Rules are useful for electricians, engineers, machinists, and all who require accurate measure. They are provided with ingenious springs which, while holding the Rule when opened in a straight line, allow its folding without any attention.

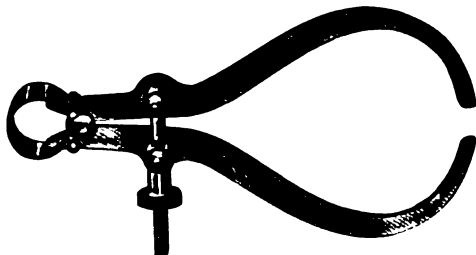
## WING DIVIDERS.



No. 1517. 7 inch.....each, \$0.40

## THE "BOSS" SPRING CALIPERS.

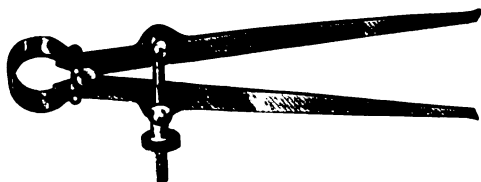
OUTSIDE.



No. 1524.

Size, 5 inches.....each, \$1.10

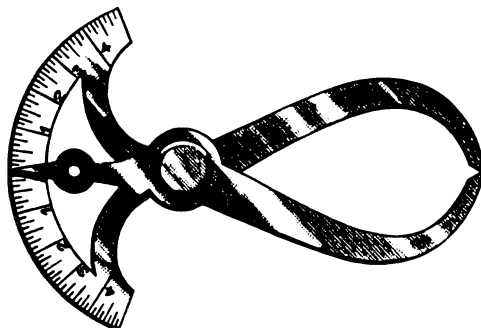
INSIDE.



No. 1524B.

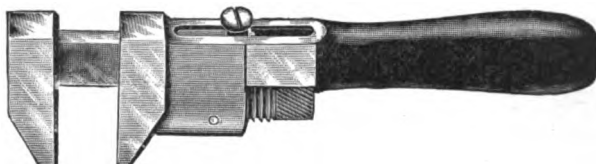
Size, 5 inches.....each, \$1.10

## REGISTERING CALIPER.



No. 1523. 5 inch.....each, \$1.20

## LIGHTNING WRENCH.



May be adjusted in an instant with one hand as rapidly as with both. By pressing with the finger and thumb, on the thumb screw, the Wrench will open to its full extent, then press on the screw on back of bar, and it will bring the Wrench to the nut, when a slight turn of thumb screw will lock it firmly.

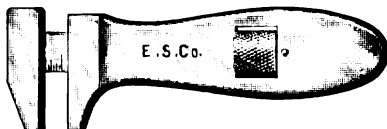
No. 2134.	10-inch.....	each, \$1.25
	12 " .....	" 1.50
" 2135.	Pocket size, nickel-plated.....	" 1.00

## COE'S PATENT WRENCH.



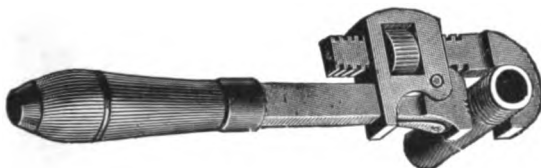
No. 2130.	Size.....	inch,	8	10	12	15	18
	Price.....	each, \$	0.60	.80	.90	1.50	1.75

## BILLINGS & SPENCER POCKET WRENCH.



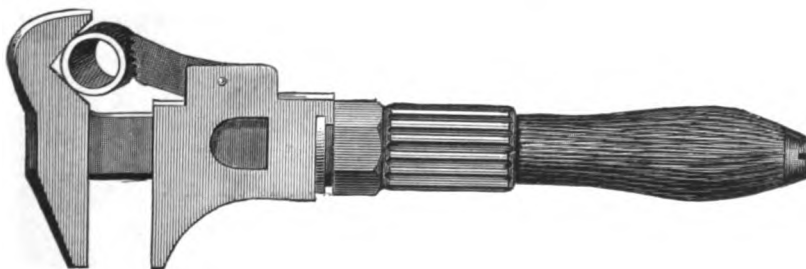
No. 2150.	4-inch, blued.....	each, \$1.10
4 "	nickel-plated.....	" 1.50

## STILLSON PIPE WRENCH.



No. 2131.	Inches, open.....	6	8	10	14	18
	Takes from.....	$\frac{1}{2}$ in. wire to $\frac{1}{2}$ in. pipe.	$\frac{3}{4}$ in. wire to $\frac{3}{4}$ in. pipe.	$\frac{1}{2}$ in. wire to 1 in. pipe.	$\frac{3}{4}$ in. wire to $1\frac{1}{2}$ in. pipe.	$\frac{1}{2}$ in. wire to 2 in. pipe.
	Each.....	\$1.80	1.80	2.00	2.70	3.55

## ENGINEERS WRENCH.



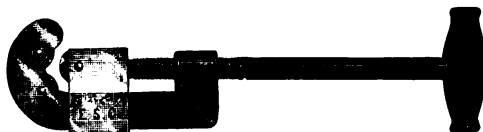
No. 2133.	10-inch.....	each, \$2.25
	12 " .....	" 2.60
	15 " .....	" 3.70

## LAG SCREW WRENCH.



No. 2128.....	each, \$1.25
---------------	--------------

## ROD AND PIPE CUTTER.



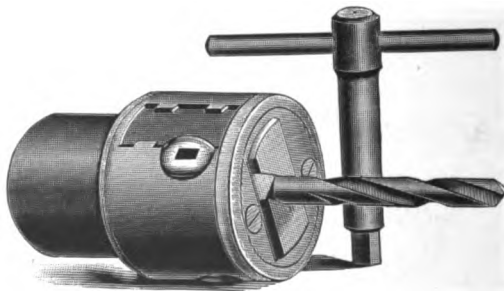
No. 2137.....each, \$4.50

## ROSE-HEAD COUNTERSINK.



No. 2083. Assorted.....per dozen, \$1.00

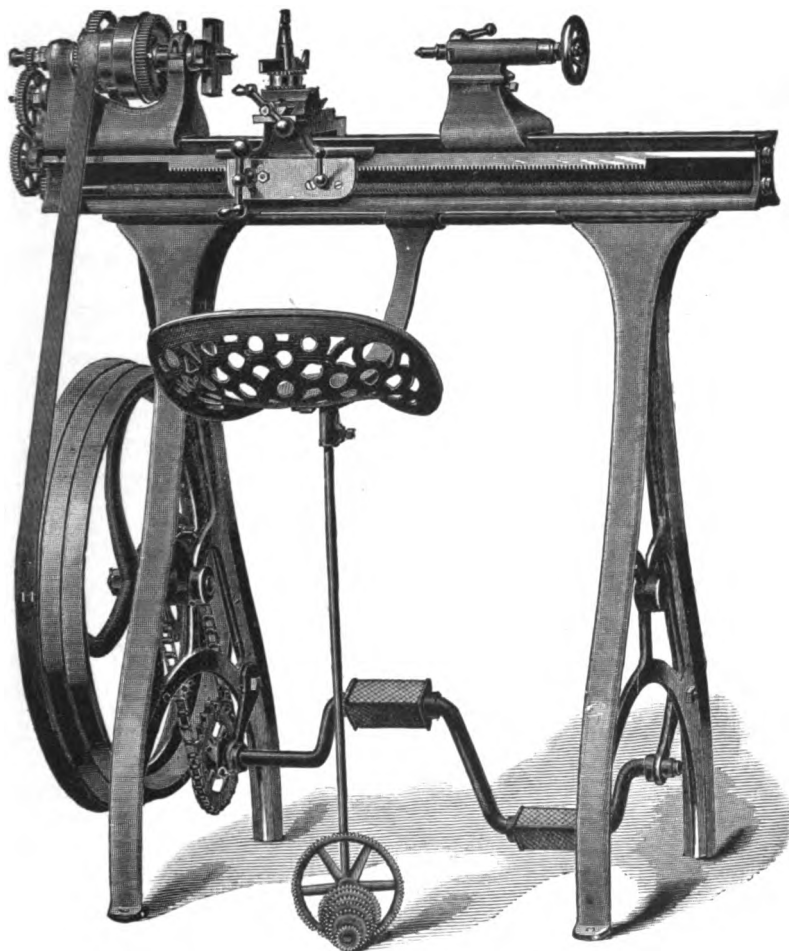
## LITTLE GIANT IMPROVED CHUCK.



This Chuck has no projections, the jaws and screws being within the body. Made of best tool steel.

No. 4253. Holds drills from 0 to  $\frac{1}{4}$  inch.....each, \$6.00

## BARNES ELECTRICIANS LATHE.



Will cut all ordinary threads from 5 to 48, and miscellaneous threads up to 154. It swings 9 inches, and takes 25 inches between centers. Swings  $4\frac{1}{2}$  inches over tool carriage.

The small pulley on cone is  $2\frac{1}{2}$  inches for winding magnets; the large pulley  $4\frac{1}{2}$  inches.

No. 2404 $\frac{1}{2}$	.....	each, \$87.50
Counter-shaft, extra	.....	" 18.75



## GENERAL

### STATION SUPPLIES.

ON articles of regular use and consumption our prices will be found to be exceedingly low, and we have given even more than our usual careful attention to the matter of quality, fully appreciating the importance of some of these goods to the economical operation of electric light stations.

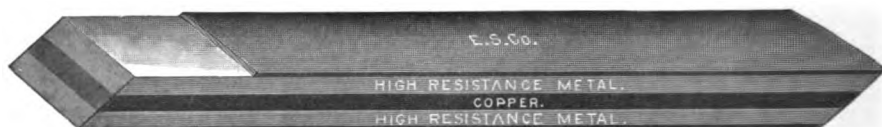
The Wirt Dynamo Brush has been recently added to our line, and its superiority over the ordinary forms of brushes is such as to entitle it to particular mention.

Our White Light Carbons are now being purchased by a great many stations, and we have found them to be all that we claimed for them—that they were more carefully made, more uniform, and would give better results than any other make of carbons.

## WIRT DYNAMO BRUSH.

Patented.

The Electrical Supply Co., Sole Manufacturers.



Since dynamos were first built there has been a constant effort exerted to reduce the difficulties attendant upon the use of the commutator. Very little success has been attained, however, with the single exception of the adoption, in some cases, of carbon as the material for the collector. The commutator is still the ghost at the banquet of the dynamo designer and a dynamo without this appendage the subject of his dreams.

The use of carbon has effected a real improvement in the case of railway motors and in some other cases. Its advantage lies in its high resistance, which tends to choke down the wasteful currents which are the principal cause of destructive sparking. This high resistance limits its usefulness to cases where the total current is small—unless, indeed, an excessive amount of commutator surface is available, permitting the use of a large aggregate body of brush material. The Wirt Brush was designed to combine the advantages of the carbon and copper brushes. The principle involves the use of a lamination of perfect and imperfect conducting materials, the good conductor being placed between two layers of higher resistance. The result is that the main current is carried away principally by the middle portion with a minimum of heat, while the wasteful currents are partly prevented and in part “wire drawn” to the point where the energy is too small to do mischief. The construction of the brush gives a cushion touch on the commutator, permitting the use of a very light tension.

The Resistance Metal in these brushes is something new in electrical art and has a resistance about fifty times that of copper or three times the resistance of German silver. It is used in sheets as thin as letter paper, the result being great flexibility producing smooth running, and, as the contact on each successive commutator bar is made first with this high resistance metal and broken also on the high resistance metal, the destructive short circuiting currents which cause the vicious sparking sometimes seen on commutators is almost entirely prevented. At the same time there is sufficient pure copper in the middle of the brush to carry the main current to the brush holder without undue heating.

We invite correspondence from those who have dynamos which are at all troublesome at the brushes. The Wirt Brushes are somewhat higher in first cost than plain copper brushes, but they will pay for themselves many times over in saving of labor and commutator copper.

These brushes are manufactured to order, and can be furnished on short notice.

When ordering please give dimensions of brushes in use.  
Prices upon application.

WIRT DYNAMO BRUSH—*Continued.*

## TESTIMONIALS.

We give, below, some testimonials from those who have given the Wirt Brush a trial.

CHICAGO, August 22, 1891.

*The Electrical Supply Co.*, Michigan Ave. and Randolph St., Chicago.

GENTLEMEN: We have used your Wirt Brushes on our incandescent dynamos for three months, and have had no sparking and scarcely any attention required during that time. I would now consider it a hardship to be obliged to use the old brushes.

Yours truly,  
(Signed)

R. C. PAGE,  
Engineer Libby Prison Museum.

THE COLUMBIA, Leading Theatre of Chicago,  
August 28, 1891.

*The Electrical Supply Co.*, Cor. Michigan Ave. and Randolph St., Chicago.

GENTLEMEN: Brushes are running with much less sparking than any I have tried. Evidently they are an improvement.

Respectfully,

GEO. CARSON.

CHICAGO, CITY HALL.  
August 27, 1891.

*The Electrical Supply Co.*, Cor. Michigan Ave. and Randolph St., Chicago.

GENTLEMEN: We have been running your brushes for two months, and find they are a decided improvement.

HENRY MUNSTERMAN,  
Chief Engineer.

CHICAGO, November 19, 1891.

*The Electrical Supply Co.*, Chicago, Illinois.

GENTLEMEN: After trying one set of your patent Dynamo Brushes, I have put them on all three of our incandescent dynamos, and like them so well that I would not be willing to use the old style of brush again.

Yours truly,

D. B. RAMSEY,  
Chief Engineer Union League Club.

DENVER, COLO., November 27, 1891.

*The Electrical Supply Co.*, Chicago, Illinois.

GENTLEMEN: I am much pleased with the brushes. I gave them the most severe test I know of, placing them on a commutator where even *carbon* brushes were not successful in reducing the sparking, and where there was a very heavy current at high potential, with a constant "chewing" up of the copper. Your brush has eliminated all trouble, and I have asked our Company to order a number of them, when I shall use them on our other dynamos.

Yours truly,

R. H. STERLING,  
Electrician Denver Consolidated Electric Company.

CHICAGO, January 20, 1892.

*The Electrical Supply Co.*, City.

GENTLEMEN: Replying to your recent favor, would say that we have been using four No. 83 Wirt Dynamo Brushes for about ten days. We find that these brushes do not spark at all, and wear but little on the commutator, keeping the surface of the latter smooth. The Wirt Brush is entirely satisfactory, and superior to any brush we have used.

(Signed)

THE CHICAGO COPPER REFINING CO.,

W. I. HITT, Secretary.

MARYSVILLE, O., January 2, 1892.

*The Electrical Supply Co.*, Chicago, Illinois.

DEAR SIR: The brushes came in good order, and after giving them a trial I find them to be the best brushes we ever used, as they run smooth and do not cut the commutator or spark. We will order more.

Very truly,

R. TURNER,  
Chief Engineer Marysville Light and Water Co.

WEST KENTUCKY INSANE ASYLUM, HOPKINSVILLE, KY., December 20, 1891.

*The Electrical Supply Co.*, Chicago, Illinois.

GENTLEMEN: Having used your Wirt Brushes for over a month, I am satisfied they are all that you claim for them. Please send me your general catalogue.

Yours respectfully,  
JNO. G. LUTZ.

## THOMSON-HOUSTON DYNAMO BRUSHES

For Arc Machines.



No. 4419. Copper, per set of four.....\$0.50

For Incandescent Machines.



No. 4421.	Copper, No. 1	.....	each, \$1.00
" 4422.	" " 2	.....	" 1.50
" 4423.	" " 3	.....	" 2.00

## CARBON BRUSHES.



The following are some of the sizes used. Special sizes will be manufactured to order, if not in stock :

Trade No.	Length, in Inches.	Width, in Inches.	Thickness, in Inches.	Price, per Hundred.
4286	$2\frac{1}{4}$	$1\frac{3}{4}$	$\frac{1}{8}$	\$10.00
4287	2	2	$\frac{1}{8}$	10.00
4288	$2\frac{1}{4}$	$1\frac{1}{2}$	$\frac{1}{8}$	10.00
4289	$2\frac{1}{4}$	$2\frac{1}{4}$	$\frac{1}{8}$	10.00
4290	$2\frac{3}{8}$	2	$\frac{3}{8}$	11.50
4291	$2\frac{1}{4}$	$2\frac{1}{4}$	$\frac{5}{8}$	11.50
4292	$2\frac{1}{2}$	$1\frac{3}{4}$	$\frac{1}{2}$	10.00
4293	2	$1\frac{3}{4}$	$\frac{1}{8}$	10.00
4294	$2\frac{1}{2}$	$1\frac{3}{4}$	$\frac{3}{8}$	10.00
4295	$2\frac{1}{2}$	$1\frac{3}{4}$	$\frac{6}{16}$	10.00
4296	9	$\frac{5}{8}$	$\frac{1}{16}$	18.00
4297	9	$\frac{1}{2}$	$\frac{3}{8}$	18.00
4298	$2\frac{3}{4}$	$1\frac{1}{2}$	$\frac{1}{8}$	10.00
4299	$2\frac{3}{4}$	$1\frac{1}{8}$	$\frac{1}{8}$	11.00
4300	$2\frac{3}{8}$	$2\frac{3}{4}$	$\frac{1}{2}$	10.00
4301	2	2	$\frac{1}{8}$	10.00
4302	2	2	$\frac{1}{16}$	10.00
4303	4	$3\frac{1}{4}$	$\frac{1}{16}$	12.00
4304	4	$1\frac{3}{4}$	$\frac{3}{8}$	12.00

When ordering brushes, please use our trade numbers or specify dimensions required.

## COMMUTATOR BRUSH COPPER.



**Cold Rolled; Spring Tempered. Made Especially for Dynamo Brushes.**

No. R. & S. Gauge.	½ inch and Nar- rower.	Over ½ inch to 1 inch.	Over 1 inch to 1½ inches.	Over 1½ inches to 2 inches.	Over 2 inches to 2½ inches.	Over 2½ ins.	No. R. & S. Gauge.	½ inch and Nar- rower.	Over ½ inch to 1 inch.	Over 1 inch to 1½ inches.	Over 1½ inches to 2 inches.	Over 2 inches to 2½ inches.	Over 2½ ins.
23	37½	37	36½	36½	36½	36	32	43½	42½	41½	41½	41½	40
24	37½	37	36½	36½	36½	36	33	44½	43½	42½	42½	42½	41
25	38½	38	37½	37½	37½	37	34	44½	43½	42½	42½	42½	41
26	38½	38	37½	37½	37½	37	35	46	45	44	44	44	42
27	40	39½	39	39	39	38	36	47	46	45	45	45	43
28	40	39½	39	39	39	38	37	50	49	46	45½	45	43
29	41	40½	40	40	40	39	38	53	49½	48	47½	47	44
30	41	40½	40	40	40	39	39	56	51	49½	48	47	44
31	43	42	41½	41½	41½	40	40	60	53	50	49	48	45

We can ship from our factory any width and thickness on short notice. Other special sizes not mentioned above will be filled by shipment direct from the factory, and where the amount so ordered is less than 100 pounds, a uniform charge of \$1.00 will be made for setting machinery, etc.

## COMMUTATOR CONSERVER.



For preventing sparking of dynamos or motors.

No. 3551. Per Candle.....\$1.00

## COMMUTATOR COMPOUND.



Dynamo tenders will find this an article of considerable convenience and merit.

No. 3552. Per pound.....\$2.00

## CRESCENT DYNAMO OIL.



Our Crescent Dynamo Oil is used for fast running machinery, such as electric light and street railway generators. It has remarkable lubricating qualities, is indestructible, and may be filtered to use over and over again. It is a perfect dynamo oil for almost any system.

No. 3525. In barrel lots, per gallon .....\$0.50

## CRESCENT CYLINDER OIL.



This is a handsome amber oil which will outwear any light cylinder oil made. It is 600 fire test and 24 gravity. This oil is used by almost all the leading manufacturing concerns in the East, and some of the best electric light companies. We guarantee it for endurance to be cheaper than any other filtered cylinder oil made.

No. 3526. In barrel lots, per gallon .....\$0.80

## "HELMET" BRAND SOLID OIL.

The Cheapest, Purest, and Best Lubricant Known. Adapted for

Use on all Kinds of Machinery.



Trade No. 3504.

Contains no acid nor pitch, therefore never injures bearings.

Will not melt at less than  $180^{\circ}$  to  $200^{\circ}$  F.; hence will not run out of the bearings and injure cotton, silk, flour, or other valuable articles of manufacture, and can be used in hot climates, or in especially heated positions on gas engines, etc.

Will not freeze, and can be used *anywhere*.

Will not clog nor gum, as it contains no pitch, nor anything but useful lubricating matter.

Can be applied in any position.

It is cleanly. Being practically heat-proof it will not melt and drop from the boxes, smearing the floor, the machinery, and everything with which it comes in contact. It has no offensive odor.

Is a sure preventive of hot boxes.

Is cheapest lubricant known. As it does not melt, there is *absolutely no waste* from running out of the bearings; does not spatter over valuable merchandise; does not rot the belts nor make them slippery, thus *saves power*, *saves the time* of the engineer in sopping up oil, *saves wiping waste*. Lasts a long time, as it adheres to the bearings. *Lubricates only when shaft is in motion*. Besides, it makes *AN AVERAGE SAVING OF 50 PER CENT.* in material used.

In tin cans.....	1 lb.	5 lbs.	10 lbs.
Per can.....	\$0.50	2.25	4.25
In packages of about.....	28 lb. Pail.	60 lb. Tub.	
	\$0.40 lb.	.39 lb.	

## THE PERFECTION SOLID OIL BOX.

These boxes *may be applied in any position*—from above, below, or at the side, on loose pulleys, connecting rods, bearings, etc. Connecting tubes can be used to reach difficult places.

The box must fit snugly in the bearing, the end placed about one-eighth of an inch from shaft.

Channel should be deeper for solid oil than for ordinary oils.

Before using solid oil, *bearings must be clean* and free from all other oils and preparations.

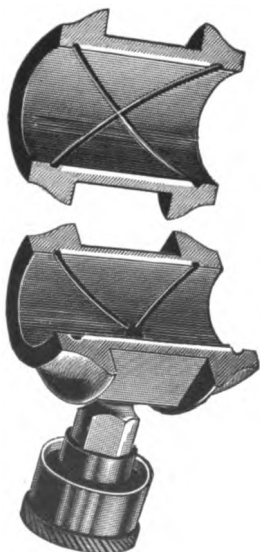
For light and medium bearings, one full turn of cap once a month.

“ loose pulleys, “ “ “ “ “ week.

“ heavy or high speed journals, “ “ “ “ “ day.



Trade No.	Diam. of Box. Inches.	For Shaft. Inches.	Unfin-ished Brass. Each.	Fin-ished Brass. Polished. Each.	Thread'd Pipe Thread.	Trade No.	Diam. of Box. Inches.	For Shaft. Inches.	Unfin-ished Brass. Each.	Fin-ished Brass. Polished. Each.	Thread'd Pipe Thread.
4440	$\frac{5}{8}$	$\frac{1}{2}$	\$ .50	\$1.00	0	4445	$2\frac{3}{8}$	$2\frac{1}{2}$	\$1.50	\$1.90	$\frac{1}{4}$
4441	$\frac{7}{8}$	$\frac{3}{4}$	.50	1.00	$\frac{1}{4}$	4446	$2\frac{1}{2}$	$3\frac{1}{4}$	1.75	2.50	$\frac{3}{8}$
4442	$1\frac{1}{4}$	1	.65	1.10	$\frac{1}{4}$	4447	$3\frac{3}{8}$	$4\frac{1}{4}$	2.20	2.80	$\frac{3}{8}$
4443	$1\frac{1}{2}$	$1\frac{1}{2}$	.85	1.25	$\frac{1}{4}$	4448	4	6	2.95	3.70	$\frac{1}{2}$
4444	2	2	1.20	1.55	$\frac{1}{4}$	4449	5	8	3.95	4.65	$\frac{1}{2}$



### DIRECTIONS

For placing Helmet Solid Oil on shafting with the Perfection Solid Oil Box.

The box must be screwed in cap tight, the end reaching within one-eighth inch of shaft. Channels should be cut one-eighth inch deep, running diagonally across the box forming the letter **X** under oil cup, connecting at extreme ends with similar channels in lower half of box.

The channel in lower box, running parallel with shaft, should be just forward of the bearing, and the edge of channel toward the bearing should be beveled off to allow the shaft to draw Helmet Oil between shaft and lower box at place where friction is greatest.

*By following the above directions you will save  
50 per cent. over soft oil.*

**SUNBEAM INCANDESCENT LAMPS.****PEAR SHAPE.****PRICE LIST.**

Trade No.	Candle Power.	Plain.	Frosted.	Colored.
3036	8	\$ .80	\$ .95	\$ .95
3037	10	.80	.95	.95
3038	16	.80	.95	.95
3039	24	.95	1.25	1.25
3040	32	1.10	1.40	1.40
3041	50	1.80	2.10	2.10

In ordering, state as follows :

Trade Number, Voltage, Base.

Plain, Frosted, or Colored (red, green, blue, or amber).

High-efficiency Lamp, or Long-lived Lamp.

For full list of Incandescent Lamps, see pages 265 to 272.

## GOE FUSE WIRE.



To avoid misapprehension, we wish our customers would remember that our Fuse Wire is, and always has been, rated by the safe carrying capacity. We adhere to this practice notwithstanding some examples to the contrary, believing that it is not desirable to attempt to compel the electric light attendant to make an arithmetical calculation each time he selects and uses a sample of Fuse Wire.

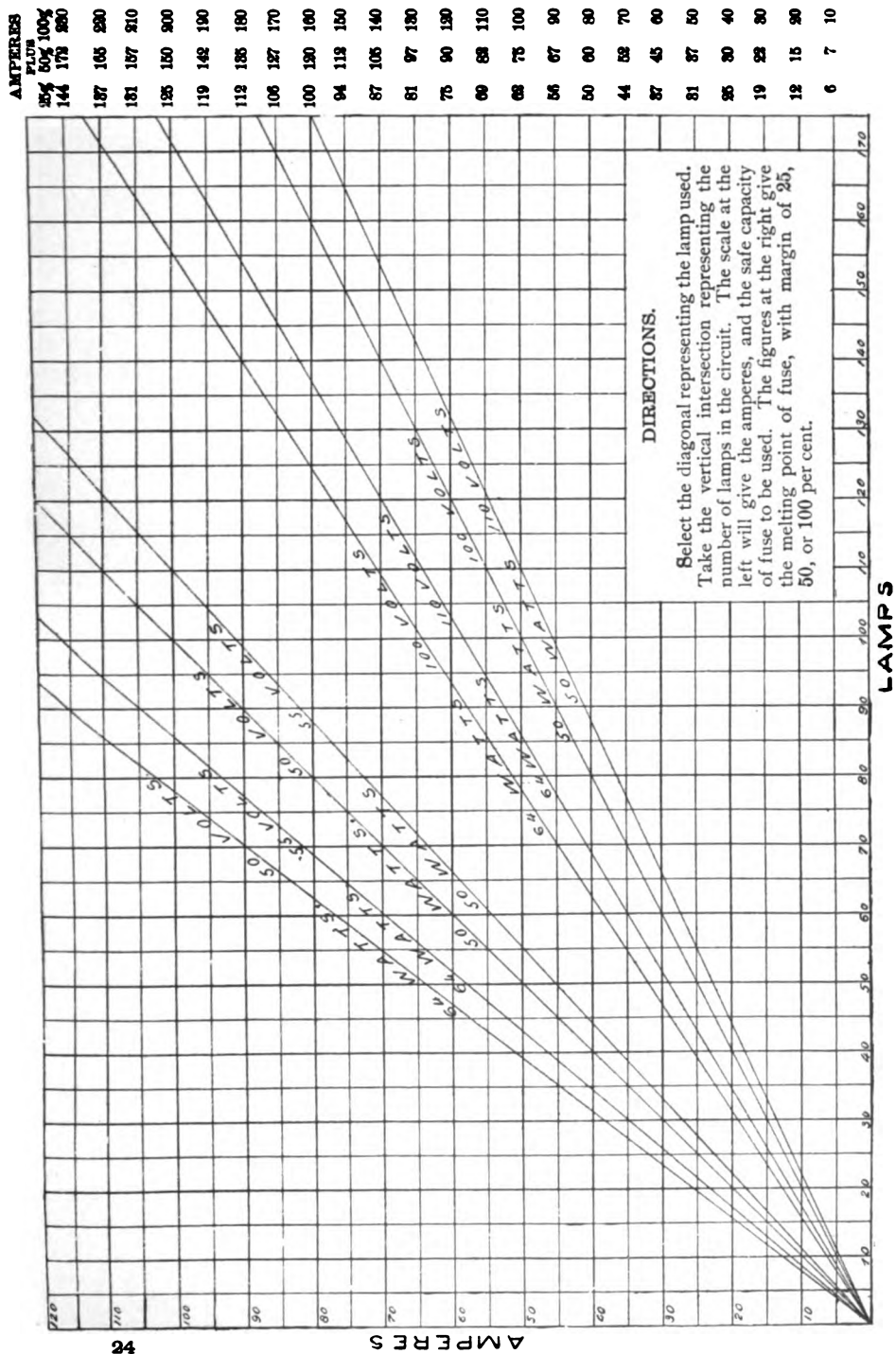
On the opposite page is given a diagram from which, at a glance, can be found the amount of current taken by any number of lamps of any character which are now in the market. This diagram will enable the user to make a proper selection of the size of wire, for any particular case, with little trouble. It should be remembered that Fuse Wire is rated for the average of ordinary conditions. Any departure from ordinary conditions should be allowed for. Extreme heat or cold, exposure to wind, etc., will alter to a large extent the ultimate ampere capacity of the fuse. Bad contact will cause the fuse to melt below its normal capacity, and if the Fuse Wire be too short, endwise, cooling will have the opposite effect, and the fuse will not melt soon enough.

TABLE AND PRICE LIST.

Trade No.	Safe Carrying Capacity in Amperes.	Price per Foot.	Price per Pound. in Full Pound Lots.
1301	1	\$0.01	\$4.00
1302	2	.01	4.00
1303	3	.01	4.00
1305	4 to 5	.01	3.00
1307	6 to 7	.01	2.00
1310	8 to 10	.02	2.00
1314	12 to 14	.03	1.50
1316	15 to 16	.03	1.50
1320	18 to 20	.03	1.50
1325	25	.03	1.50
1330	30	.04	1.50
1335	35	.05	1.50
1340	40	.06	1.50
1350	50	.08	1.50
1360	60	.09	1.25
1370	70	.10	1.25
1380	80	.12	1.25
1400	100	.16	1.25
1425	125	.20	1.25
1450	150	.24	1.25
1475	175	.28	1.25
1480	200	.32	1.25

GOE FUSE WIRE—*Continued*

Diagram showing current taken by any number of lamps.



## THE WIRT RELIABLE FUSE LINKS.

These links are rated according to their safe carrying capacity, and should be ordered accordingly. They are put up in packages containing one hundred links, and each package is plainly marked with the safe capacity, and also with the actual fusing current, as determined by a test on each lot made. The method of manufacture of these links, as well as the character of the material itself, favors precision in the results to a degree not yet attained with any fuse wire which it has been possible to make.

We invite correspondence from electricians and engineers requiring fuses which can be depended upon to act with the utmost promptness and accuracy.



Cut Full Size.  
No. 3164.

3 Ampere safe carrying capacity	.....	each, \$	0.02
5   "   "   "   "	.....	"	.02
10   "   "   "   "	.....	"	.02



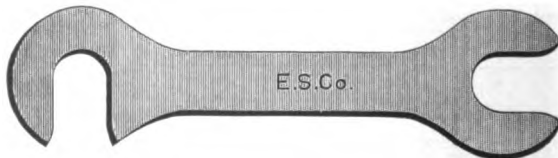
Cut Full Size.  
No. 3168.

10 Ampere safe carrying capacity	.....	each, \$	0.03
15   "   "   "   "	.....	"	.03
20   "   "   "   "	.....	"	.03
25   "   "   "   "	.....	"	.03



Cut Full Size.  
No. 3173.

20 Ampere safe carrying capacity	.....	each, \$	0.05
30   "   "   "   "	.....	"	.05
40   "   "   "   "	.....	"	.05
50   "   "   "   "	.....	"	.05



Cut Full Size.  
No. 3178.

60 Ampere	.....	each, \$	0.07
75   "	.....	"	.07
100   "	.....	"	.07
125   "	.....	"	.07
150   "	.....	"	.07

**FUSE LINKS.**

With Copper Terminals.



3 Ampere capacity ..... each, \$0.07  
 6 " " ..... " .07

No. 3183.

**FUSE LINKS.**

With Copper Terminals.

3 Ampere capacity ..... each, \$0.10

6 " " ..... " .10  
 9 " " ..... " .10  
 12 " " ..... " .10  
 15 " " ..... " .10  
 20 " " ..... " .14  
 25 " " ..... " .14



No. 3185.

**FUSE LINKS.**

With Copper Terminals.



No. 8192.

30 Ampere capacity ..... each, \$0.16  
 40 " " ..... " .16  
 50 " " ..... " .16  
 60 " " ..... " .16  
 75 " " ..... " .16

**FLAT FUSE STRIPS.**

With Copper Terminals.



No. 3212.		No. 3224.	
2 1/4 inches between Centers. For 7-16 inch Screw.		2 1/4 inches between Centers. For 1/4 inch Screw.	
Safe Carrying Capacity in Amperes.	Each.	Safe Carrying Capacity in Amperes.	Each.
25	\$0.18	25	\$0.18
50	.18	50	.18
75	.18	75	.18
100	.21	100	.21
125	.21	125	.21
150	.21	150	.21
175	.21	175	.21
200	.25	200	.25
250	.25		
300	.25		

Any length or any carrying capacity furnished to order.



## KERITE TAPE.



- No. 1201. In rolls (about 1 lb. each)  $\frac{3}{4}$  inch wide, per roll.....\$1.40  
 " 1203. On spools (convenient for linemen)  $\frac{3}{4}$  inch wide, per spool... .40

## TAYLOR TAPE.



This is a soft, adhesive, black gum Tape. With this Tape it is possible to make a joint that will stand being laid in wet plaster. The joint, after being properly soldered and cleaned, should be covered with three or four over-lapping layers; then gently heated, smoothed down with the fingers, and finished by at least two coats of adhesive cotton-rubber tape.

- No. 1212. In rolls,  $\frac{3}{4}$  inch wide, per pound.....\$1.40

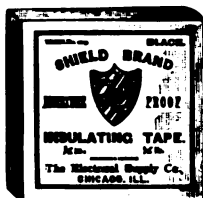
## E. S. RUBBER TAPE.



This is a very pliable cotton-rubber tape, containing a fair proportion of pure rubber.

- No. 1207. White,  $\frac{3}{4}$  inch wide, per pound.....\$0.90  
 " 1207 B. Black,  $\frac{3}{4}$  " " " ..... .95

## SHIELD BRAND TAPE.



A thoroughly good, moisture-proof insulating tape. Adhesive qualities permanent.

No. 1213. Per pound ..... \$0.65

## CHATTERTON'S INSULATING COMPOUND.



Inferior grades of this material have recently appeared on the market. Our customers can be assured of getting none but the standard quality from us.

No. 1221. Per pound ..... \$3.50

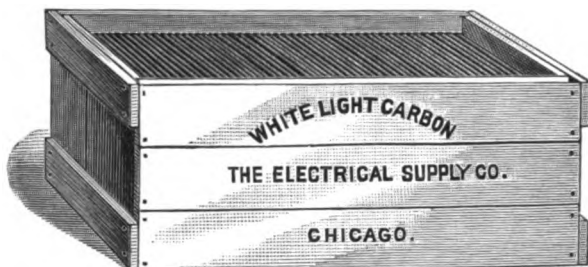
## SHIELD BRAND SPLICING COMPOUND.



Will not corrode bare copper, always pliable, never hardens, absolutely water, gas, acid, and moisture proof.

No. 1224. Per stick, 12 in. .... \$0.50

## WHITE LIGHT CARBONS.



These Carbons have a firm texture, free from seams and impurities, and will produce a white, pure light.

### PRICE LIST FOR 12-INCH CARBONS.

No. 3651.	Soft Molded Carbon, plain, $\frac{7}{16}$ inch diameter, for 5 to $7\frac{1}{2}$ ampere 1,200 C. P. arc lamps, used for inside lighting where quality of light is to be considered before life of the carbon .....	per 1,000, \$12.85
" 3661.	Hard Molded Carbon, coppered, $\frac{7}{16}$ inch diameter, for 10 ampere 2,000 C. P. lamps. These carbons will be supplied for high-tension systems, unless otherwise specified .....	" " 12.85
" 3663.	Same as No. 3661, $\frac{1}{2}$ inch in diameter. For high-tension systems, where long life is desired ....	" " 14.30
" 3681.	Hard Forced Carbon, coppered, $\frac{7}{16}$ inch diameter, for 18 to 20 ampere 2,000 C. P. lamps .....	" " 12.85
" 3683.	Same as No. 3681, $\frac{1}{2}$ inch in diameter. These carbons will be supplied for low-tension systems, unless otherwise specified .....	" " 14.30

The above prices are F. O. B. factory; if wanted from Chicago, for freight add 75 cents thousand, net.

## TREATED CORED CARBONS.

For use in arc lamps which are operated on incandescent circuits. The cored are used as upper carbons only. The regular solid carbons being used for the lower ones.

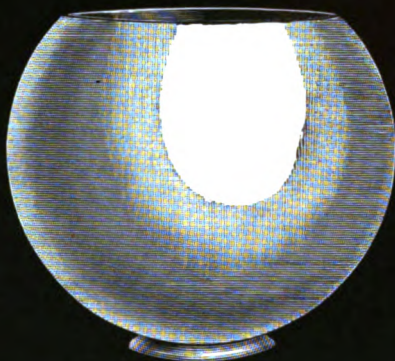
No. 3655.	Per 1,000 .....	\$21.50
-----------	-----------------	---------



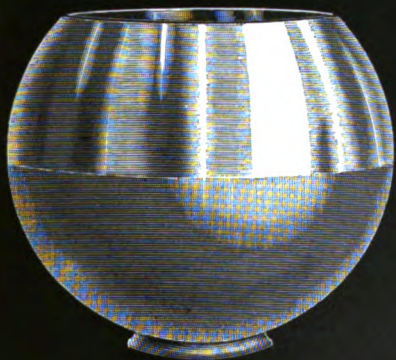
## ARC LAMP GLOBES.



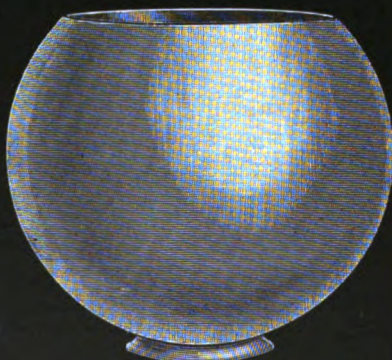
CLEAR.



OPAL.



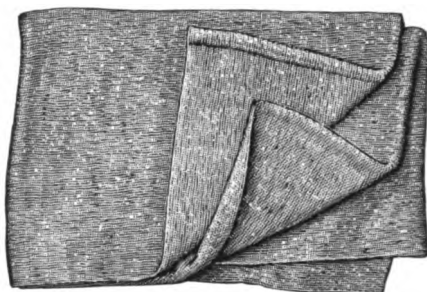
HALF GROUND.



ALL GROUND.

In ordering, send, if possible, a sketch with dimensions plainly marked. Always state height, diameter, size of bottom opening, and finish.  
Prices quoted upon application.

## RAW-SILK MACHINE WIPERS.



These Pure Silk Wipers have so many decided advantages over cotton waste for use around machinery as to leave no doubt of the economy of their use. They are so woven as to prevent fraying, and will leave no lint. They may be washed and used over and over again. Their adoption will remove the constant danger of fire from oily wastes, etc. *Raw silk is not spontaneously combustible.*

No. 2195.....each, \$0.20

## SILK SPONGE PADS.



These Sponge Pads will be found useful in cleaning arc light globes, or in removing dirt and grease from any substance.

No. 2192.....each, \$0.20

## COTTON WASTE.



No. 3513. White, for dynamo work, per pound.....\$0.14

“ 3515. Colored, for engine work “ ..... .11

## LAMP ROD POLISHING CLOTH.



Crocus cloth, for inside arc lamps. Will not scratch the rods, but leaves them with a polished surface, free from dirt. It may also be used for outside work, except in damp weather, when it is likely to gum the rods, causing them to stick.

Cut to the proper size for use, to prevent waste, and put up in pads of 36 pieces, convenient size for lamp tenders.

No. 2196.	Per pad .....	\$ .25
	In full sheets, per sheet .....	.05
	" " " " quire .....	1.00

## EMERY CLOTH

For outside arc lamps. This will clean the rods satisfactorily and will not gum them in damp weather, and for that reason is preferred by some to crocus cloth, although it will wear the rods faster, and necessitates replacing with new rods oftener than if crocus cloth is used.

Cut to the proper size for use, to prevent waste, and put up in pads of 36 pieces, convenient size for lamp tenders.

No. 2198.	Per pad .....	\$ .25
	In full sheets, per quire .....	1.00

## ROD POLISH.



No. 2200.	Per box .....	\$0.25
-----------	---------------	--------



## MANUFACTURERS'

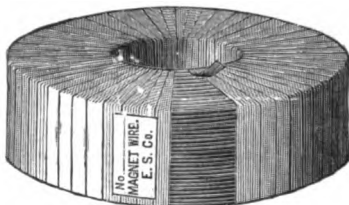
## SPECIAL MATERIAL.

**I**N the following pages we show such materials as are generally used only in the manufacture of dynamos, motors, etc. We manufacture our own magnet wire and are, therefore, able to quote the lowest prices, while, as we have had over ten years' experience in manufacturing insulated wires, the quality we furnish may be fully relied upon.

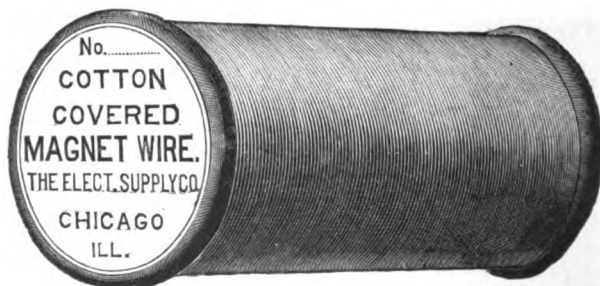
## COTTON COVERED MAGNET WIRE.

For Armatures, Field Magnets, etc.

To No. 20 B. & S. Gauge.



No.	Diameter Bare Wire.	Single.	Double.	No.	Diameter Bare Wire.	Single.	Double.
0000	.4600	\$0.42	\$0.44	9	.11443	\$0.44	\$0.48
000	.4096	.42	.44	10	.10189	.44	.48
00	.3648	.42	.44	11	.09074	.46	.50
0	.3249	.42	.44	12	.08081	.46	.50
1	.2893	.42	.44	13	.07196	.52	.56
2	.2576	.42	.44	14	.06408	.52	.56
3	.2294	.42	.44	15	.05706	.56	.60
4	.20431	.42	.44	16	.05082	.56	.60
5	.18194	.42	.44	17	.04525	.58	.64
6	.16202	.42	.44	18	.04030	.58	.64
7	.14428	.42	.46	19	.03589	.62	.70
8	.12849	.42	.46	20	.03196	.62	.70



SINGLE—Finer than No. 20 B. & S. Gauge.

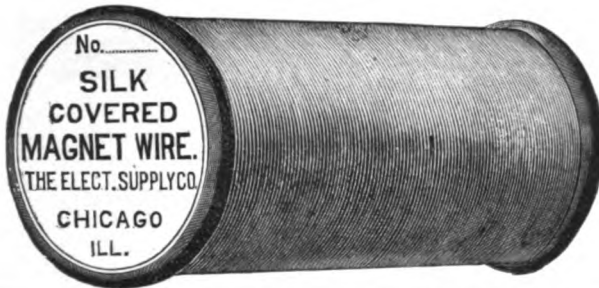
On Regular Spools.

No.	Diameter Bare Wire.	Per Pound.	No.	Diameter Bare Wire.	Per Pound.
21	.02846	\$ .70	29	.011257	\$1.50
22	.025347	.76	30	.010025	1.65
23	.022571	.83	31	.008928	1.80
24	.0201	.90	32	.00795	2.25
25	.0179	1.00	33	.00708	2.76
26	.01594	1.10	34	.0063	3.28
27	.014195	1.25	35	.00561	3.74
28	.012641	1.35	36	.005	5.04

For full list of Magnet Wire, see pages 30 to 32.

## SILK COVERED MAGNET WIRE.

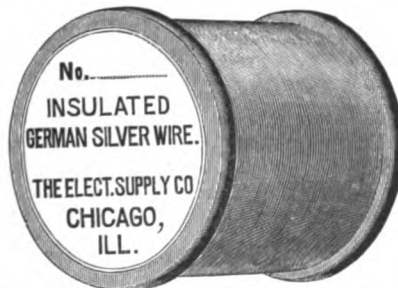
Single, on Regular Spools.



No.	Diameter, Bare Wire.	Per Pound.	No.	Diameter, Bare Wire.	Per Pound.
16	.05082	\$1.12	27	.014195	\$2.25
17	.04525	1.12	28	.012641	2.38
18	.04030	1.15	29	.011257	2.75
19	.03589	1.15	30	.010025	2.95
20	.03196	1.18	31	.008928	3.25
21	.02846	1.20	32	.00795	3.96
22	.025347	1.30	33	.00708	4.49
23	.022571	1.42	34	.0063	4.72
24	.0201	1.56	35	.00561	6.72
25	.0179	1.81	36	.005	8.05
26	.01594	2.10			

For Full List of Magnet Wire, see pages 30 to 32.

## INSULATED GERMAN SILVER WIRE.



No. B. & S. Gauge.	WHITE, COTTON WOUND.		GREEN, SILK WOUND.		No. B. & S. Gauge.	WHITE, COTTON WOUND.		GREEN, SILK WOUND.	
	Single, per Pound.	Double, per Pound.	Single, per Pound.	Double, per Pound.		Single, per Pound.	Double, per Pound.	Single, per Pound.	Double, per Pound.
16	\$1.40	\$1.70	\$1.85	\$2.38	29	\$ 2.60	\$ 3.13	\$ 3.85	\$ 5.00
17	1.40	1.70	1.85	2.38	30	2.84	3.38	4.14	5.33
18	1.40	1.70	1.85	2.38	31	3.09	3.66	4.52	5.81
19	1.40	1.70	1.85	2.38	32	4.14	4.84	5.68	7.17
20	1.42	1.74	1.88	2.43	33	4.55	5.33	6.27	7.93
21	1.44	1.75	1.93	2.48	34	5.31	6.25	6.71	8.38
22	1.52	1.83	2.06	2.64	35	5.76	6.55	8.65	10.86
23	1.62	1.98	2.21	2.87	36	9.30	10.21	11.50	13.50
24	1.71	2.09	2.37	3.08	37	14.95	15.81	21.28	25.30
25	1.84	2.26	2.65	3.48	38	27.60	31.05	32.20	38.00
26	2.05	2.48	3.02	3.93	39	31.05	34.50	34.50	46.00
27	2.25	2.73	3.23	4.20	40	34.50	38.00	51.75	57.50
28	2.45	2.98	3.42	4.43					

## SHIELD BRAND MOISTURE-PROOF INSULATION.



### STRANDED CONDUCTORS.

Trade No.	Number of Wires.	Size of Wires.	Equivalent in Carrying Capacity.	Approximate Weight per 1,000 Feet.	Approximate Weight per Mile.	Price per Pound.
186	21	19	6 B. & S.	118 lbs.	623 lbs.	\$0.55
196	49	23	6 "	120 "	634 "	.65
198	49	25	8 "	74 "	391 "	.65
170	28	25	10 "	32 "	169 "	.65

For full list of Shield Brand Insulation, see pages 6 to 9.

## HABIRSHAW SWITCH BOARD CABLES.

### INDIA-RUBBER INSULATION.



Very Flexible.

Trade No.	Gauge No.	M Cir. Mils.	Price per Foot. Cents.	Trade No.	Gauge No.	M Cir. Mils.	Price per Foot. Cents.
H 300	8 B. & S.	16,500	17	H 308	Special Dynamo Cord, 61-24.	29,524	30½
H 301	6 "	26,250	19				
H 302	5 "	33,102	20				
H 303	4 "	41,742	24				
H 304	3 "	52,634	30½				

H. 100.

## HABIRSHAW FIXTURE WIRE.

### INDIA-RUBBER INSULATION.



Trade No.	SINGLE CONDUCTOR.		Trade No.	DOUBLE CONDUCTOR.	
	Gauge B. & S.	Price per Foot. Cents.		Gauge B. & S.	Price per Foot. Cents.
200	18	2½	201	18	3½
202	16	3	203	16	5½
204	14	3½	205	14	6½

H. 100.

For full list of Habirshaw Insulation, see pages 12 to 27.

## SPRING BRASS WIRE.

For Armature Binding.



No. 18 B. & S.	Per lb. coils	.....	\$0.25
" 20 "	" "	.....	.26
" 22 "	" "	.....	.28
" 24 "	" "	.....	.32

## GERMAN SILVER RESISTANCE WIRE.

18 Per Cent. (Commercial) Ger. Silver.



Half-Hard.

No. B. & S.	Coils.	5 and 10 lb. Spools.	1-lb. Spools.	No. B. & S.	Coils.	5 and 10 lb. Spools.	1-lb. Spools.
9	\$0.65	----	----	24	\$ .95	----	\$ 1.15
10	.65	----	----	25	1.00	----	1.20
11	.65	----	----	26	1.20	----	1.40
12	.65	----	----	27	1.30	----	1.50
13	.65	----	----	28	1.40	----	1.60
14	.65	----	----	29	1.55	----	1.75
15	.67	\$0.67	----	30	1.75	----	1.85
16	.67	.77	----	31	1.95	----	2.20
17	.68	.78	----	32	2.85	----	2.60
18	.69	.79	----	33	2.60	----	2.85
19	.69	.79	----	34	2.95	----	3.20
20	.79	.89	\$ .99	35	3.65	----	3.95
21	.82	.92	1.02	36	6.50	----	6.80
22	.86	.96	1.06	37	11.50	----	12.00
23	.90	----	1.10	38	18.00	----	19.00

## PLATINUM WIRE.



No. B. & S.	Per Foot.	No. B. & S.	Per Foot.
12	\$12.00	26	\$0.60
14	8.00	28	.45
16	5.00	30	.30
18	3.00	32	.20
20	2.00	34	.15
22	1.25	36	.10
24	.85		

## ARMATURE TWINE.



No. 4361. In  $\frac{1}{2}$  pound balls, per ball..... \$1.25

## HARD RUBBER TUBING.



In Lengths of 24 inches.

Outside Diameter.	Inside Diameter.	Price per Pound.	Approximate Weight.
$\frac{1}{8}$ inch	$\frac{1}{8}$ inch	\$1.50	84 Tubes 1 lb.
$\frac{1}{8}$ "	$\frac{1}{8}$ "	1.50	100 " "
$\frac{3}{16}$ "	$\frac{3}{16}$ "	1.50	44 " "
$\frac{3}{16}$ "	$\frac{3}{16}$ "	1.50	52 " "
$\frac{3}{16}$ "	$\frac{3}{16}$ "	1.25	35 " "
$\frac{3}{16}$ "	$\frac{3}{16}$ "	1.25	37 " "
$\frac{1}{2}$ "	$\frac{1}{2}$ "	1.25	20 " "
$\frac{1}{2}$ "	$\frac{1}{2}$ "	1.25	28 " "
$\frac{1}{2}$ "	$\frac{1}{2}$ "	1.25	5 $\frac{1}{2}$ " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.25	19 " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.25	5 " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.00	14 " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.00	10 " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.00	4 $\frac{1}{2}$ " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.00	4 " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.00	14 " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.00	4 " "
$\frac{5}{8}$ "	$\frac{5}{8}$ "	1.00	3 " "
1 "	1 "	1.00	2 $\frac{1}{2}$ " "
1 "	1 "	1.00	2 " "
1 $\frac{1}{8}$ "	1 $\frac{1}{8}$ "	1.00	2 " "
1 $\frac{1}{4}$ "	1 $\frac{1}{4}$ "	1.00	1 " $\frac{3}{4}$ lb.
1 $\frac{1}{4}$ "	1 " "	1.00	1 $\frac{1}{2}$ " 1 lb.

## HARD RUBBER SHEETS.



Size of Sheets, 20 x 48 Inches.

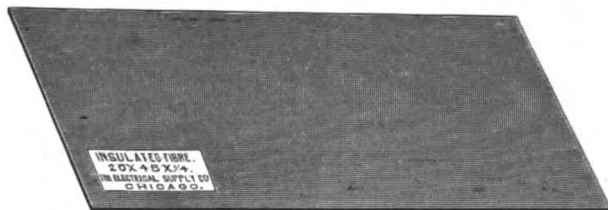
Thickness.		Approximate Weight of Full Sheets.	Price per Pound.	Thickness.		Approximate Weight of Full Sheets.	Price per Pound.
Stubs' Gauge.	Inches.			Stubs' Gauge.	Inches.		
24	----	14 oz.	\$1.80	10	$\frac{1}{8}$	5 $\frac{1}{2}$ lb.	\$1.20
23	----	1 lb.	1.80	9	$\frac{3}{32}$	6 "	1.20
22	$\frac{1}{32}$	$1\frac{1}{8}$ "	1.35	----	$\frac{1}{16}$	7 $\frac{1}{2}$ "	1.20
21	----	$1\frac{1}{4}$ "	1.35	----	$\frac{1}{8}$	10 $\frac{1}{2}$ "	1.20
20	----	$1\frac{1}{2}$ "	1.20	----	$\frac{3}{16}$	13 $\frac{1}{2}$ "	1.20
19	----	$1\frac{3}{4}$ "	1.20	----	$\frac{1}{2}$	16 $\frac{1}{2}$ "	1.20
18	----	2 "	1.20	----	$\frac{5}{8}$	18 $\frac{3}{4}$ "	1.20
17	----	2 $\frac{1}{4}$ "	1.20	----	$\frac{3}{4}$	22 "	1.20
16	$\frac{1}{16}$	2 $\frac{3}{4}$ "	1.20	----	$\frac{7}{8}$	24 "	1.20
15	----	3 "	1.20	----	$\frac{15}{16}$	27 "	1.20
14	----	3 $\frac{1}{4}$ "	1.20	----	$\frac{15}{16}$	32 "	1.20
13	$\frac{3}{32}$	3 $\frac{3}{8}$ "	1.20	----	$\frac{1}{8}$	35 "	1.20
12	$\frac{1}{10}$	4 $\frac{1}{8}$ "	1.20	----	1	40 "	1.20
11	----	5 $\frac{1}{4}$ "	1.20	----	1 $\frac{1}{4}$	50 "	1.20

## HARD RUBBER RODS.

In Lengths of 24 Inches.

Diameter.	Approximate Weight.	Price per Pound.	Diameter.	Approximate Weight.	Price per Pound.
$\frac{1}{8}$ inch.	74 Rods 1 lb.	\$1.20	$\frac{7}{8}$ inch.	1 Rod 9 oz.	\$1.20
$\frac{3}{32}$ "	42 " 1 "	1.20	$\frac{15}{16}$ "	1 " 11 "	1.20
$\frac{1}{16}$ "	30 " 1 "	1.20	1 "	1 " 13 "	1.20
$\frac{1}{8}$ "	18 " 1 "	1.20	$1\frac{1}{8}$ "	1 " 1 lb.	1.20
$\frac{3}{16}$ "	13 " 1 "	1.20	$1\frac{1}{4}$ "	1 " $1\frac{1}{4}$ "	1.20
$\frac{1}{2}$ "	8 " 1 "	1.20	$1\frac{3}{8}$ "	1 " $1\frac{1}{2}$ "	1.35
$\frac{5}{8}$ "	6 " 1 "	1.20	$1\frac{1}{2}$ "	1 " $1\frac{3}{4}$ "	1.35
$\frac{3}{4}$ "	5 " 1 "	1.20	$1\frac{5}{8}$ "	1 " 2 $\frac{1}{4}$ "	1.35
$\frac{7}{8}$ "	4 " 1 "	1.20	$1\frac{3}{4}$ "	1 " 2 $\frac{1}{2}$ "	1.35
$\frac{15}{16}$ "	3 " 1 "	1.20	2 "	1 " 3 $\frac{3}{8}$ "	1.35
$1\frac{1}{16}$ "	1 " 6 oz.	1.20	$2\frac{1}{4}$ "	1 " 4 $\frac{1}{8}$ "	1.35
$1\frac{1}{8}$ "	1 " 7 "	1.20	$2\frac{1}{2}$ "	1 " 5 "	1.35
$1\frac{1}{4}$ "	1 " 8 "	1.20			

## HARD SHEET INSULATING FIBRE.



Size of Sheet, 16 to 24 inches wide by about 50 inches long.

This material is free from grit, is hard and dense, and at the same time exceedingly tough and elastic under compression. It can be worked in a lathe, drilled, riveted, sawed, and stamped; can be fitted with sharp, strong screw threads, receives a fine polish, and is an *excellent insulator* in all dry positions.

Thickness of Sheet.	Approx. Weight of Full Sheet.	Price per Pound.		Thickness of Sheet.	Approx. Weight of Full Sheet.	Price per Pound.	
		Full Sheet.	Cut to Order.			Full Sheet.	Cut to Order.
1 inch.	115 lbs.	\$0.80	\$1.25	$\frac{1}{2}$ inch.	30 $\frac{1}{2}$ lbs.	\$0.62 $\frac{1}{2}$	\$ .88
$\frac{3}{4}$ "	97 "	.75	1.20	$\frac{1}{8}$ "	20 "	.62 $\frac{1}{2}$	.85
$\frac{1}{2}$ "	86 "	.75	1.18	$\frac{3}{8}$ "	16 "	.62 $\frac{1}{2}$	.85
$\frac{3}{8}$ "	70 "	.75	1.15	$\frac{1}{4}$ "	14 "	.62 $\frac{1}{2}$	.85
$\frac{1}{4}$ "	63 "	.62 $\frac{1}{2}$	.90	$\frac{3}{16}$ "	11 $\frac{1}{2}$ "	.62 $\frac{1}{2}$	.85
$\frac{1}{8}$ "	54 "	.62 $\frac{1}{2}$	.90	$\frac{1}{16}$ "	7 $\frac{1}{2}$ "	.75	1.00
$\frac{1}{16}$ "	43 "	.62 $\frac{1}{2}$	.90	$\frac{3}{32}$ "	5 "	.82	1.10
$\frac{1}{32}$ "	35 "	.62 $\frac{1}{2}$	.88	$\frac{1}{64}$ "	3 "	.90	1.35

We carry in Chicago a stock of all the above thicknesses. Other thicknesses furnished to order.

Our stock consists of red only, but we furnish either white or black at a slightly advanced price. We cut directly across sheets only, where less than a whole sheet is wanted.

## INSULATING OIL PAPER.



Used in insulating armatures, fields, etc.

No. 4110. Size of Sheet, 21 x 30 inches..... each, \$0.15

## UNCUT SHEET MICA.

For Electrical Purposes.



Trade No.	Will Cut in Width, Inches.	Will Cut in Length, Inches.	Price per Pound.	Trade No.	Will Cut in Width, Inches.	Will Cut in Length, Inches.	Price per Pound.
4280	5 to 10	7 to 16	\$5.40	4283	2 to 4	4 to 6	\$1.30
4281	3 " 6	6 " 10	3.60	4284	1 " 3	2½ " 5	.50
4282	2 " 5	4 " 8	2.00	4285 } Amber. }	4 " 10	6 " 12	3.70

Our Mica is guaranteed to be perfectly free from iron spots.

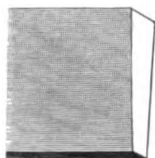
## CUT SHEET MICA.

For Electrical Purposes.



Size.	Price per lb.	Size.	Price per lb.	Size.	Price per lb.	Size.	Price per lb.	Size.	Price per lb.
1½x2	\$.40	2 x5½	\$2.40	2½x6	\$4.25	3½x4	\$5.00	4½x 5	\$8.00
1½x2½	.40	2 x6	3.00	2½x6½	4.50	3½x4½	5.25	4½x 4½	7.50
1½x2½	.40	2 x6½	3.50	2½x7	5.00	3½x4½	5.50	4½x 5	8.25
1½x2½	.45	2 x7	4.00	2½x8	5.50	3½x4½	6.25	4½x 5½	8.75
1½x8	.50	2 x7½	4.25	2½x2½	.85	3½x5	7.25	4½x 6	9.25
1½x8½	.55	2 x8	4.50	2½x3	1.00	3½x5½	7.50	4½x 6½	9.50
1½x8½	.60	2½x2½	.50	2½x3½	1.20	3½x5½	7.75	4½x 7	9.75
1½x8½	.65	2½x2½	.55	2½x3½	1.35	3½x6	8.50	4½x 8	10.00
1½x4	.75	2½x2½	.60	2½x3½	1.50	3½x3½	4.50	4½x 9	10.25
1½x4½	.85	2½x3	.70	2½x4	1.75	3½x3½	5.00	5 x 5	8.50
1½x4½	1.00	2½x3½	.85	2½x4½	2.25	3½x4	5.50	5 x 5½	9.00
1½x5	1.50	2½x3½	.95	2½x4½	2.75	3½x4½	5.75	5 x 6	9.50
1½x5½	1.90	2½x3½	1.10	2½x4½	3.50	3½x4½	6.50	5 x 6½	9.75
1½x6	2.40	2½x4	1.25	2½x5	4.50	3½x4½	7.00	5 x 7	10.00
1½x2	.50	2½x4½	1.50	2½x5½	4.75	3½x5	7.50	5 x 8	10.25
1½x2½	.50	2½x4½	1.75	2½x5½	5.25	3½x5½	8.25	5 x 9	10.50
1½x2½	.50	2½x4½	2.00	2½x6	5.75	3½x6	8.75	5 x10	11.00
1½x2½	.50	2½x5	2.40	2½x6½	6.25	3½x6½	8.75	5½x 5½	9.25
1½x3	.60	2½x5½	2.50	2½x7	6.75	3½x7	9.00	5½x 6	9.75
1½x3½	.65	2½x5½	3.00	3 x3	1.80	3½x8	9.25	5½x 7	10.25
1½x3½	.75	2½x6	3.40	3 x3½	2.15	3½x9	9.50	5½x 8	10.50
1½x3½	.90	2½x6½	3.65	3 x3½	2.60	3½x8½	5.50	5½x 9	10.75
1½x4	1.00	2½x6½	3.90	3 x3½	3.00	3½x4	5.80	6 x 6	10.00
1½x4½	1.25	2½x7	4.25	3 x4	4.00	3½x4½	6.25	6 x 6½	10.25
2 x2	.50	2½x8	5.00	3 x4½	4.75	3½x4½	6.75	6 x 7	10.50
2 x2½	.50	2½x2½	.70	3 x4½	5.50	3½x4½	7.25	6 x 8	10.75
2 x2½	.50	2½x2½	.75	3 x4½	6.00	4 x4	6.25	6 x 9	11.00
2 x2½	.60	2½x3	.85	3 x5	7.00	4 x4½	7.00	6 x10	11.50
2 x3	.65	2½x3½	.95	3 x5½	7.50	4 x5	7.75	6 x11	12.00
2 x3½	.70	2½x3½	1.00	3 x6	8.00	4 x5½	8.50	7 x 7	10.75
2 x3½	.80	2½x3½	1.20	3 x6½	8.25	4 x6	9.00	7 x 8	11.00
2 x3½	.90	2½x4	1.30	3 x7	8.50	4 x6½	9.25	7 x 9	11.25
2 x4	1.10	2½x4½	1.60	3 x8	8.75	4 x7	9.50	7 x10	12.00
2 x4½	1.20	2½x4½	2.25	3 x9	9.00	4 x8	9.75	8 x 8	12.00
2 x4½	1.40	2½x4½	2.75	3½x3½	3.50	4½x4½	6.75	8 x 9	12.50
2 x4½	1.50	2½x5	3.50	3½x3½	4.00	4½x4½	7.25	8 x10	13.00
2 x5	1.75	2½x5½	3.75	3½x3½	4.50	4½x4½	7.75		

## COMMUTATOR COPPER BARS.



Beveled Strips.

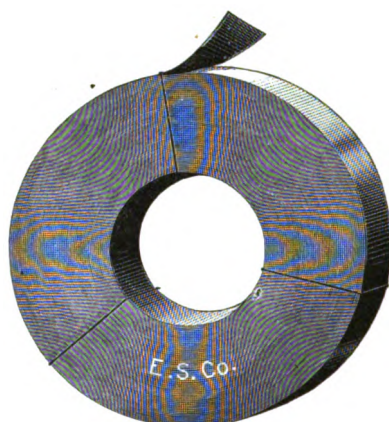
This is superior for commutators of dynamos or motors, being exactly of the right temper and uniformly drawn. Any size or shape made to order on short notice. Prices quoted on application. On first order for special sizes we charge extra for dies. The following sizes will be furnished without making charge for dies :

## REGULAR DIMENSIONS.

Trade No.	Width in Inches.	Thickness Each Side in Inches.	Trade No.	Width in Inches.	Thickness Each Side in Inches.
4362	$1\frac{3}{4}$	$\frac{5}{16}$ and $\frac{3}{16}$	4380	$\frac{1}{16}$	$\frac{3}{16}$ and $\frac{3}{32}$
4363	$1\frac{1}{2}$	$\frac{1}{16}$ " $\frac{1}{16}$	4381	$\frac{5}{16}$	$\frac{7}{32}$ " $\frac{7}{64}$
4364	$1\frac{1}{2}$	$\frac{7}{32}$ " $\frac{5}{64}$	4382	$\frac{3}{4}$	$\frac{1}{4}$ " $\frac{3}{16}$
4365	$1\frac{1}{4}$	$\frac{3}{16}$ " $\frac{3}{16}$	4383	$\frac{3}{4}$	$\frac{1}{16}$ " $\frac{1}{8}$
4366	$1\frac{3}{16}$	$\frac{3}{16}$ " $\frac{1}{16}$	4384	$\frac{3}{4}$	$\frac{7}{32}$ " $\frac{1}{16}$
4367	$1\frac{3}{16}$	$\frac{9}{32}$ " $\frac{5}{64}$	4385	$\frac{3}{4}$	$\frac{1}{16}$ " $\frac{3}{32}$
4368	$1\frac{1}{8}$	$\frac{3}{16}$ " $\frac{1}{16}$	4386	$\frac{3}{4}$	$\frac{1}{16}$ " $\frac{5}{64}$
4369	$1\frac{1}{8}$	$\frac{1}{16}$ " $\frac{5}{64}$	4387	$\frac{3}{4}$	$\frac{3}{32}$ " $\frac{5}{64}$
4370	$1\frac{5}{16}$	$\frac{1}{16}$ " $\frac{1}{16}$	4388	$\frac{1}{16}$	$\frac{7}{32}$ " $\frac{3}{32}$
4371	1	$\frac{3}{16}$ " $\frac{1}{16}$	4389	$\frac{1}{16}$	$\frac{9}{64}$ " $\frac{3}{64}$
4372	1	$\frac{1}{16}$ " $\frac{1}{8}$	4390	$\frac{3}{16}$	$\frac{1}{16}$ " $\frac{3}{32}$
4373	1	$\frac{7}{32}$ " $\frac{3}{32}$	4391	$\frac{1}{16}$	$\frac{1}{16}$ " $\frac{5}{64}$
4374	$\frac{5}{16}$	$\frac{3}{16}$ " $\frac{1}{16}$	4392	$\frac{5}{8}$	$\frac{1}{16}$ " $\frac{5}{64}$
4375	$\frac{1}{16}$	$\frac{1}{16}$ " $\frac{1}{16}$	4393	$\frac{5}{8}$	$\frac{7}{16}$ " $\frac{1}{16}$
4376	$\frac{1}{16}$	$\frac{1}{16}$ " $\frac{9}{32}$	4394	$\frac{3}{16}$	$\frac{1}{16}$ " $\frac{7}{64}$
4377	$\frac{1}{16}$	$\frac{3}{8}$ " $\frac{9}{32}$	4395	$\frac{1}{16}$	$\frac{1}{16}$ " $\frac{1}{4}$
4378	$\frac{1}{16}$	$\frac{3}{32}$ " $\frac{1}{16}$	4396	$\frac{1}{16}$	$\frac{1}{16}$ " $\frac{5}{64}$
4379	$\frac{1}{16}$	$\frac{3}{32}$ " $\frac{1}{16}$			

## COMMUTATOR BRUSH COPPER.

In Rolls.



Cold Rolled ; Spring Tempered. Made Especially for Dynamo Brushes.

No. B. & S. Ga'ge	½ inch and Nar- rower.	Over ½ inch to 1 inch.	Over 1 inch to 1½ inches.	Over 1½ inches to 2 inches.	Over 2 inches to 2½ inches.	Over 2½ ins.	No. B. & S. Ga'ge	½ inch and Nar- rower.	Over ½ inch to 1 inch.	Over 1 inch to 1½ inches	Over 1½ inches to 2 inches.	Over 2 inches to 2½ inches.	Over 2½ ins.
23	37½	37	36½	36½	36½	36	32	43½	42½	41½	41½	41½	40
24	37½	37	36½	36½	36½	36	33	44½	43½	42½	42½	42½	41
25	38½	38	37½	37½	37½	37	34	44½	43½	42½	42½	42½	41
26	38½	38	37½	37½	37½	37	35	46	45	44	44	44	42
27	40	39½	39	39	39	38	36	47	46	45	45	45	43
28	40	39½	39	39	39	38	37	50	49	48	45½	45	43
29	41	40½	40	40	40	39	38	53	49½	48	47½	47	44
30	41	40½	40	40	40	39	39	56	51	49½	48	47	44
31	43	42	41½	41½	41½	40	40	60	53	50	49	48	45

We can ship from our factory any width and thickness on short notice. Other special sizes not mentioned above will be filled by shipment direct from the factory, and where the amount so ordered is less than 100 pounds, a uniform charge of \$1.00 will be made for setting machinery, etc.

# BINDING POSTS.

SAFETY.



No. 389.

DYNAMO.



No. 390.

WINDOW.



No. 392.

Each .....\$0.90      Each .....\$0.40

Each .....\$0.18

The post and screw head is completely covered with hard rubber  $\frac{1}{8}$  inch thick, nicely finished. It presents no conducting surface to the touch whatever.



No. 381.

Each .....\$0.08



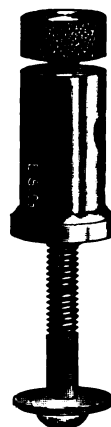
No. 382.

Each .....\$0.20



No. 383.

Each .....\$0.20



No. 384.

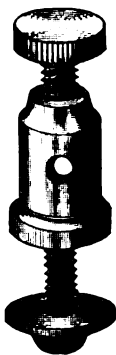
Each .....\$0.12

# BINDING POSTS

*Continued.*



No. 308.  
Each.....\$0.28



No. 307.  
Each.....\$0.18



No. 306.  
Each.....\$0.15



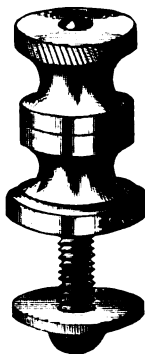
No. 310.  
Each.....\$0.10



No. 345.  
Each.....\$0.16



No. 345 1/2.  
Each.....\$0.17



No. 346.  
Each.....\$0.18



No. 349.  
Each.....\$0.16



No. 353.  
Each.....\$0.22



No. 352.  
Each.....\$0.20



No. 351.  
Each.....\$0.18



No. 312.  
Each.....\$0.10

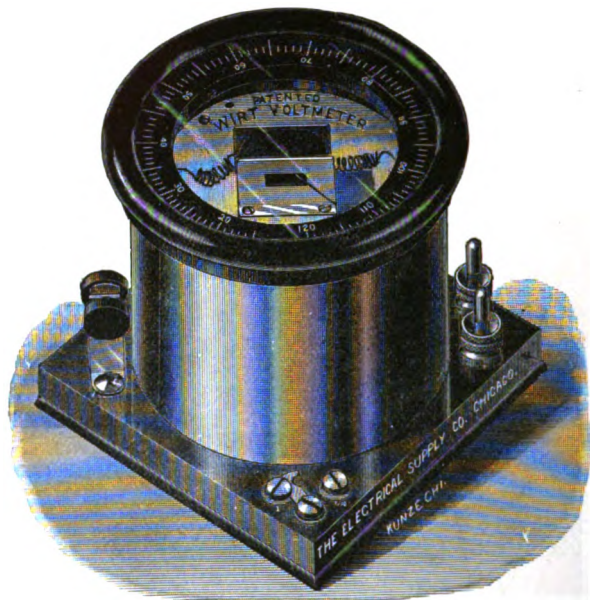
## ELECTRICAL

### TESTING INSTRUMENTS.

**I**N this department we have made great advances in the line of commercial indicating instruments, and accurate standard testing instruments. It is well known to all experienced electricians and contractors, that this line of goods has been one of the least perfect so far, and that the electrical engineer has been forced to put up with apparatus deficient in adaptability and perfection to a degree which would not be tolerated in older and better developed lines of engineering. The value in dollars and cents of accuracy in electric lighting work is only now beginning to be appreciated, and many station electricians can be found to-day who do not know that an error of 3 per cent. in a volt meter may double their bills for incandescent lamps, or that errors by no means rare in electricity meters may rob the central station, in many cases, of 10 or 20 per cent., or even more, of its income.

## WIRT STANDARD VOLT METER.

Patented, November 11, 1890, and March 24, 1891.



Since we first placed this Volt Meter on the market a number of others have been born, have flourished and died, while the Wirt Standard has attained a reputation for accuracy and reliability such as is possessed by no other instrument of its class. A volt meter is a difficult instrument to put into commercial shape, for the reason that the force to be measured is necessarily very small; hence instruments for this purpose are usually extremely delicate or extremely unsatisfactory owing to lack of sensitiveness. Mr. Wirt was the first to appreciate the necessity of abandoning the use of springs, electro-magnets, permanent magnets, heating effects, or the magnetism of the earth as the forces against which to measure electrical pressure. The principle of action of this instrument is a patented modification of the potentiometer elaborated by Clark and Dr. Fleming as an instrument of precision, but requiring a large amount of labor, skill, and appreciation of practical conditions to put into the form of a portable instrument.

With these instruments we give an unqualified guarantee that they will remain accurate for one year. No wood is used in their construction, the workmanship and material is of the best, and they can be expected to give a very long, useful life.

The range of the instrument by direct reading is from 15 to 125 volts. By shifting the link on the base this reading can be multiplied by 2 or divided by 10, making a total range of from 1.5 to 250 volts. The sensitiveness is all that can be desired, and the scale being a very open one, readings can easily be made to one-tenth of a division. This means that a single cell of storage battery or the electro-motive force of an incandescent dynamo can be correctly read to one-tenth of one per cent.

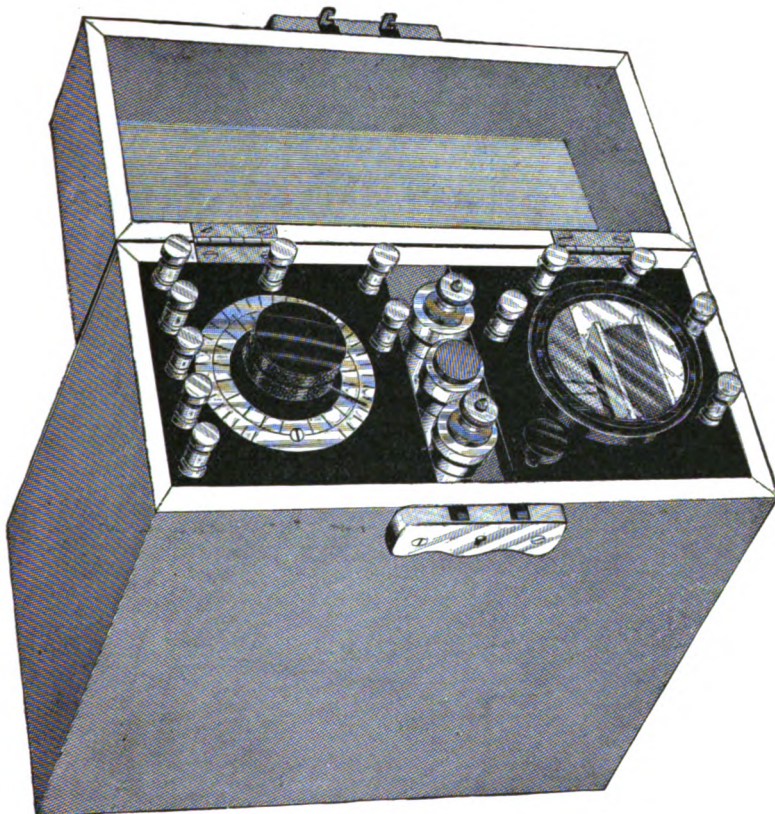
A fuse is provided to save the instrument in case of accidental contact with an unusually high tension current. This fuse is easily accessible and can be replaced by anybody if necessary. We were led to insert this feature by observing the fact that all volt meters occasionally suffer from accidental contact with pressures for which they were not designed, unless some such protection is provided.

A contact fork and flexible cord is also provided with each instrument. This is a great convenience in making quick connection, dispensing with the use of the binding screw and avoiding danger of short circuit in the flexible line which is used for connecting.

No. 2546. Range from 1.5 to 250 volts.....each, \$60.00

## THE WIRT VOLT METER.

Patented.

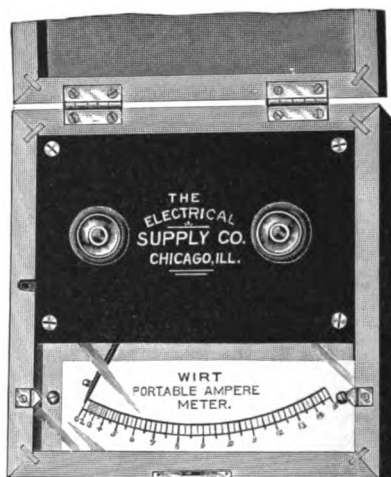


The principles of operation in this instrument are similar to the Wirt Standard Volt Meter described on preceding page. It is complete within itself, and direct reading. The coils and galvanometer are so arranged that the instrument may be used for testing insulation, etc., which will be found convenient.

No. 2545. Range from 2 to 130 Volts.....each, \$40.00

## WIRT PORTABLE AMPERE METERS.

Patented.



These instruments are designed to meet the demand for a small portable instrument, which can be sold at a moderate price. They are well made, constant, and accurate. The action in these instruments is extremely simple and sensitive, and having no permanent magnet or other part liable to change with time, they will be found equally accurate after long service as when new. There is but little liability of their getting out of order from rough handling. They are direct reading, and can be used without special instruction. To be left in circuit if desired.

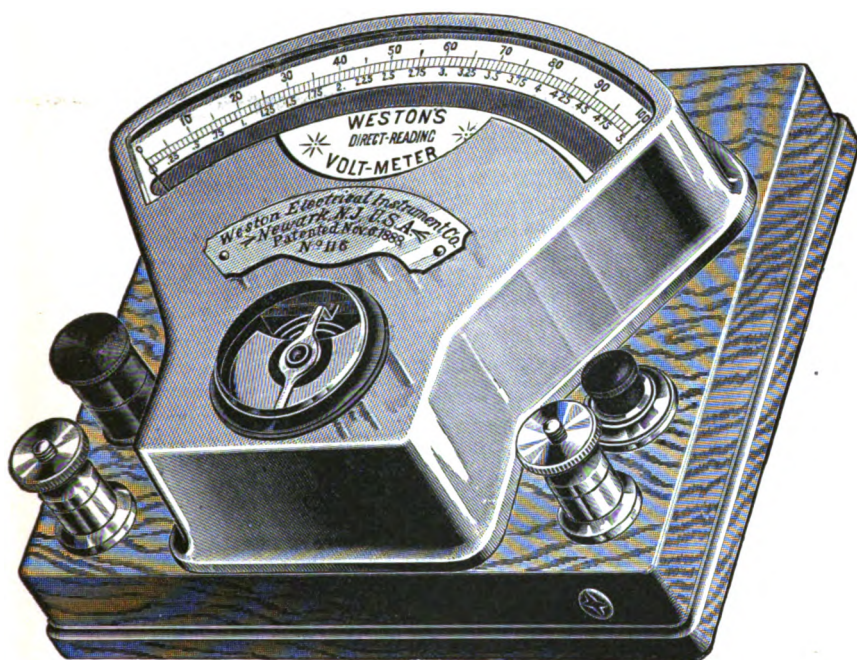
Trade No. 2684.	Reading from 0 to	1½ Amperes	each, \$35.00
" " 2685.	" " 0 " 5	"	" 35.00
" " 2686.	" " 0 " 15	"	" 35.00
" " 2687.	" " 0 " 25	"	" 35.00
" " 2688.	" " 0 " 50	"	" 37.50
" " 2689.	" " 0 " 100	"	" 40.00

## WIRT PORTABLE BATTERY VOLT METER.

This instrument is designed for those who have anything to do with batteries, whether manufacturing, buying, selling, or using. It is very accurate and sensitive, simple and not easy to get out of order. The scale is direct reading in volts from nothing to two and a half, and the resistance of the instrument being exactly one ohm, the same divisions and figures on the scale will read amperes as well as volts: in other words the scale will read volts and amperes of the battery being tested, on a resistance of one ohm. This makes the instrument somewhat different from an ordinary volt meter or ampere meter in the sense that it gives the battery being tested a definite amount of work to do, and measures that work accurately. For storage battery work this instrument will be found very valuable, as it will show the slightest variation from the normal of individual cells. An instrument of this kind is almost indispensable in maintaining a storage battery in proper condition, as it is well known that the greatest injury results from allowing a battery to discharge more than is proper, or charging it up to a higher potential than is safe.

No. 2692.	0 to 2½ Volts	each, \$35.00
-----------	---------------	---------------

## WESTON VOLT METERS.



No. 2768.	Scale, 0 to 150 volts.....	each, \$55.00
" 2769.	Scale, 0 to 150 volts, and 0 to 5 volts.....	" 75.00
" 2771.	Scale, 0 to 600 volts, by 5-volt divisions readable to $\frac{1}{2}$ volt .....	" 65.00
" 2772.	Scale, 0 to 600 volts, and 0 to 150 volts.....	" 80.00

The above instruments are the ones usually carried in stock. Other readings furnished to order.

## WESTON AMMETERS.

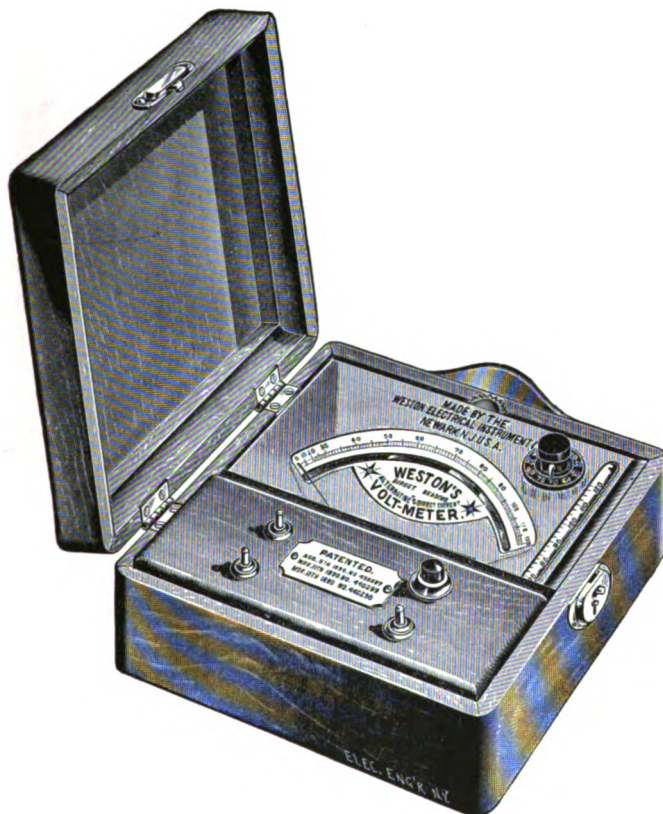


No. 2780.	1½	Ampere Scale, divisions 1/10 Ampere, readable to 1/100 Ampere	each, \$55.00
" 2781.	5	Ampere Scale	" 65.00
" 2782.	15	" "	" 65.00
" 2783.	25	" "	" 65.00
" 2784.	50	" "	" 65.00
" 2785.	100	" "	" 70.00
" 2786.	150	" "	" 75.00
" 2787.	200	" "	" 80.00
" 2788.	250	" "	" 80.00
" 2789.	300	" "	" 80.00

The above instruments are the ones usually carried in stock. Other readings furnished to order.

## WESTON DIRECT-READING VOLT METERS.

For Alternating and Direct Currents.



This instrument is the only one in compact portable form, which can be applied to the measurement of either direct or alternating currents. It is direct reading, and is provided with a key, which also acts as a damper to bring the pointer to rest. The electro dynamometer principle is employed—a movable coil, swinging inside of a stationary coil and controlled by a spring. A thermometer is placed inside the instrument to indicate the temperature of the coils, and a small dial is provided for making a correction when the temperature varies from the standard. The instrument is contained in a well finished mahogany box, provided with a lock and handle.

No. 2792.	Single Scale,	10 to 80 Volts	.....	each, \$60.00
" 2793.	" "	10 to 120 "	.....	" 65.00
" 2794.	Double "	10 to 60, and 10 to 120 Volts	.....	" 70.00

The above instruments are the ones usually carried in stock. Other readings furnished to order.

## AYRTON & PERRY VOLT METERS.



No. 2551.	Calibrated for readings of 15 to 75 Volts.....	each, \$40.00
" 2552.	" " " 25 to 135 " .....	" 40.00

## AYRTON & PERRY AMMETERS.

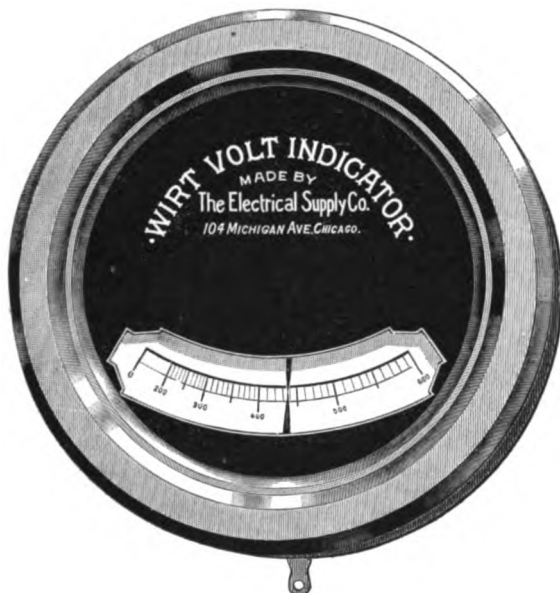


No. 2563.	Calibrated for readings of 15 to 75 Amperes.....	each, \$37.50
" 2564.	" " " 20 to 100 " .....	" 37.50

The following long-range Ammeters are now in stock :

No. 2566.	Calibrated for readings of .1 to .5 Amperes.....	each, \$40.00
" 2567.	" " " .15 to .75 " .....	" 40.00
" 2568.	" " " .2 to .1 " .....	" 40.00

## WIRT VOLT INDICATORS.



Patented.

**FOR STATIONARY WORK ONLY. TO BE LEFT IN CIRCUIT CONTINUOUSLY.**

These instruments had their origin, like many other inventions, in necessity. The impossibility of obtaining good results in incandescent lighting with indicators which were liable sooner or later to vary, led us to a series of investigations into existing instruments, and, finding them all more or less defective, to the designing and subsequent perfecting of the instrument which we herewith offer. Before the advent of incandescent lighting no such necessity existed for precise electrical indicators as has existed since. With the introduction into the everyday work of the steam engineer of an apparatus like the incandescent lamp, requiring, for good commercial results, to be worked year in and year out at a pressure varying of not more than 1 per cent., a demand was soon manifest for something that could be relied upon more than a few days or a few months. To go into the defects of most of the apparatus of this class now in use would require a large amount of space. Sufficient to say, most of them fail from some or all of the following faults:

1. Lack of sensitiveness, due to friction of imperfect pivots, or to the introduction of gearing or its equivalent.
2. Imperfect calibration, due to the use of incorrect standards or lack of skill.
3. Momentary change of resistance, due to effect of changing temperature.
4. Permanent change of resistance, due to the use of carbon as a resistance or to imperfect insulation.

## WIRT VOLT INDICATORS

*Continued.*

5. Magnetic errors, due to the use of iron without regard to the amount, proper selection, size, or shape of such part.

6. Errors from variation in the springs used as controlling force.

7. Large consumption of energy with attendant heating, rendering the instrument unfit for continuous service.

8. General debility rapidly overtaking those instruments constructed largely of wood or in which the working parts are not absolutely inclosed and protected from fumes, dust, and dirt.

Our instruments are sent out packed exactly like steam gauges and can be handled with the same freedom.

The cases are entirely of metal, as are all the other parts, except where insulating material is used.

Every instrument is sealed and secured against curious meddlers. We will exchange any instrument proving defective or inaccurate any time within one year, provided it is returned with these seals unbroken.

Sensitiveness is amply provided for by making the moving system extremely light and pivoting the same in ruby jewels with strong, well tempered, perfectly polished pivots.

They can be read at a distance, and with ordinary eyes a variation of 1 per cent. is very quickly noticed with the help of the movable index or sight, which is provided with all volt indicators, and with constant current ampere indicators

No keys are provided with these instruments, as they are intended to be left in circuit continuously. The consumption of energy is so small that this is entirely permissible.

### DIRECTIONS FOR PLACING.

Screw the instrument to a wall or partition that is vertical. Before tightening the screws, see that the pointer swings free and stands at zero. Connect the lines to the binding post without regard to which is positive or negative, as it makes no difference which way the current passes through the instrument. The lever projecting underneath moves the adjustable index. Set this index at the point where it is desired to run. This feature is intended to give a sight-mark visible at long range, and will be found a great relief to the eyes.

Special readings made to order. In volt indicators we assume the scale will be used mostly for the higher readings, and accordingly arrange the divisions so that those which are most used will be the longest, in order to have the greatest possible deflection for a given variation. This feature will be appreciated by those who have had experience with instruments which require inspection at close range.

No. 2496.	Reading up to	60 volts (for alternating currents)	.....	each, \$45.00
" 2497.	"	120 " " direct	" .....	" 45.00
" 2498.	"	140 " " "	" .....	" 45.00
" 2499.	"	275 " " "	" .....	" 55.00
" 2500.	"	600 " " "	" .....	" 60.00

## WIRT AMPERE INDICATORS.

Patented.



These are similar in electrical design to the Volt Indicators, described on the preceding page. The principle is one which lends itself very perfectly to the production of instruments of large ampere capacity, and these are distinguished for low resistance, and the ease with which they can be accurately calibrated. These Ampere and Volt Indicators are identical in external appearance, which adds very much to symmetry of design when they are placed together on a switch board.

No. 2501.	10 Amperes	.....	each, \$30.00
" 2502.	15	" .....	" 30.00
" 2503.	30	" .....	" 30.00
" 2504.	50	" .....	" 30.00
" 2505.	100	" .....	" 35.00
" 2506.	150	" .....	" 40.00
" 2507.	200	" .....	" 45.00
" 2508.	300	" .....	" 65.50
" 2509.	400	" .....	" 70.00
" 2510.	500	" .....	" 75.00
" 2511.	1,000	" .....	" 90.00

## B.-W. AMPERE INDICATORS.

Patented.

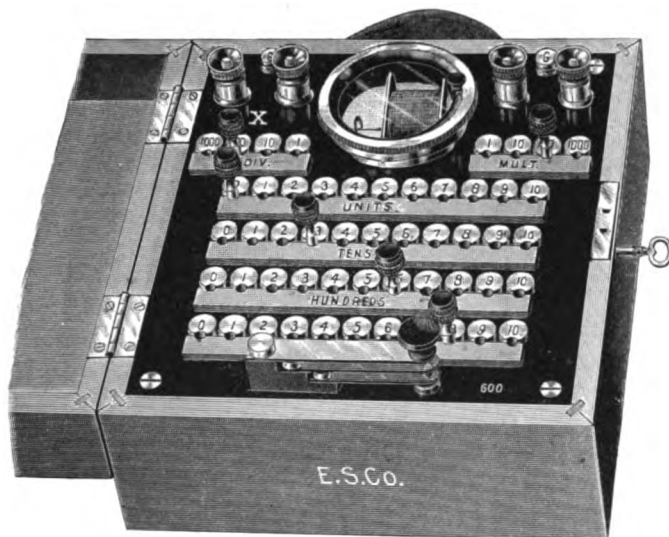


These instruments contain the same action as the Wirt Indicators, but are put up in a plainer case. We have avoided the use of wood in this instrument, as we think the wooden age of electrical engineering is about passed. The cases are of solid metal, dust-proof and moisture-proof, and are finished in antique bronze. The scale is a very open one, and can easily be read at a considerable distance. These instruments are not effected by outside influence, or by transportation or handling, and they may be relied upon to remain constant and to stand wear.

No. 2679.	0- 15	.....	each, \$20.00
" 2680.	0- 25	.....	" 20.00
" 2681.	0- 50	.....	" 20.00
" 2682.	0-100	.....	" 22.50

## PORTABLE TESTING SET.

Wheatstone Bridge and Galvanometer Combined.



This is a complete and portable form of apparatus for measuring resistances, consisting of a sensitive galvanometer, set of resistance coils with bridge coils, and keys, all contained in a polished mahogany case. Each coil is separately and carefully standardized. The resistances are arranged in four rows, of ten coils each, the rows being designated Units, Tens, Hundreds, and Thousands.

There are 1, 10, 100, and 1,000 ohm coils on each arm of the bridge, thus giving an extreme range of measurement from  $\frac{1}{1000}$  to over 10,000,000 ohms. This extreme range, of course, can not be fully utilized with the kind of galvanometer which it is possible to put into a portable instrument, accordingly binding posts G G are provided, which are intended to permit connecting a Thompson galvanometer to the bridge, thus increasing its usefulness as a laboratory instrument.

The arrangement of the coils is such that six plugs only are needed in this set—one in each arm of the bridge, and one in each row of coils—making the reading the simplest possible. For example: If with  $A=100$ , and  $B=10$ , to obtain a balance, it is necessary to plug 5 in the *Thousands*, 0 in the *Hundreds*, 7 in the *Tens*, and 2 in the *Units* row, the resistance measured is equal to 507.2 ohms.

Particular attention is called to the fact that the galvanometer can be turned and placed in the meridian line without moving the box. In moving the galvanometer, means are provided for retaining its proper bridge connections. A needle lifter is provided, so that when the set is not in use, the center pin will not be injured.

These instruments are smaller, as at present made, than heretofore. The finish is equal to the finest, and the accuracy all that can be asked for practical work.

No. 2512. Measuring from  $\frac{1}{1000}$  to 10,000,000 ohms.....each, \$95.00

## STANDARD PORTABLE TESTING SETS.



T 305.

Several very decided improvements over existing forms are embodied in this set. The galvanometer is of the D'Arsonval type, and is made very strong and portable.

It is extremely dead beat, and is unaffected by mechanical vibrations and proximity to masses of iron or intense magnetic fields, being at the same time very sensitive. These qualifications will be recognized as of great value by those having had experience in making tests on shipboard and other places where these conditions must be met.

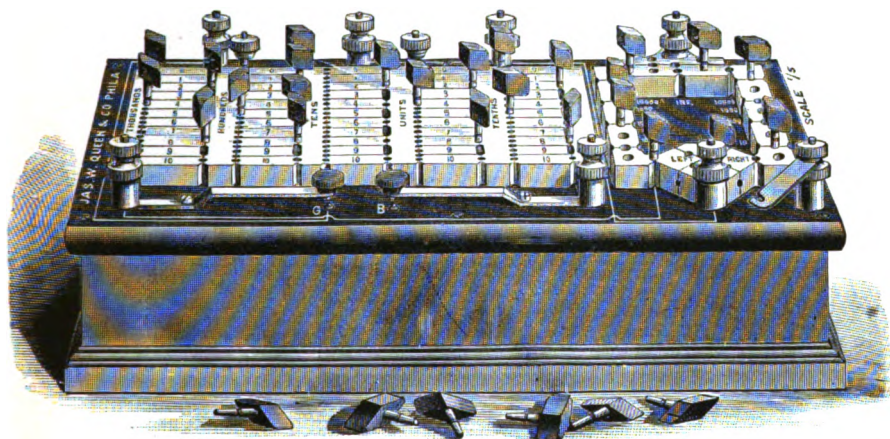
The resistance coils of the rheostat are placed in four rows of ten coils each, viz.: ten units, ten tens, ten hundreds, and ten thousands. These coils are so connected that but one plug is required in each row, and each plug throws in as many coils of the denomination as are indicated by the number engraved on the corresponding block. Another very valuable feature of this set, and one not heretofore found except in the most expensive laboratory instruments, is the reversing arrangement at the end opposite the galvanometer. In this way by using coils 1, 10, and 100 on one side, and 10, 100, and 1,000 on the other, one can always obtain a ratio of 1-1,000, thus being able to measure from  $\frac{1}{1000}$  of an ohm to ten meg-ohms. The reversal of the bridge arms is very simply effected, all that is required being to change the position of two plugs. The form is especially convenient to carry, as it measures only 18 inches long by 6 $\frac{1}{2}$  inches broad. The coils are all wound with the famous platinoid wire, which has a very low temperature coefficient and high specific resistance, and are adjusted to a high percentage of accuracy. The brass and rubber top are both nicely finished, and the mahogany case very finely polished.

T 305.	Portable Testing and Resistance Set (improved 1891 type), complete, with D'Arsonval galvanometer. Coils wound with platinoid wire and guaranteed accurate within $\frac{1}{2}$ of 1 per cent. Total resistance 11,110 ohms; range of set, .001 to 10,000,000 ohms. Bridge arms with special reversing device. Galvanometer can be removed from the box and used separately if desired. This set is highly recommended for marine testing.....	\$125.00
	The same, with fibre suspended galvanometer, as shown in cut.....	125.00
T 306.	Portable Testing and Resistance Set, similar to T 305, but without galvanometer,.....	100.00
T 307.	Portable Testing and Resistance Set, complete with galvanometer. Coils wound with German silver wire and accurately adjusted. Total resistance, 11,110 ohms; range, .001 to 10,000,000 ohms. Bridge without special reversing device. Galvanometer with fibre suspension. It can not be removed from the box.....	90.00
T 308.	Portable Testing and Resistance Set, similar to T 307, but without galvanometer,.....	75.00
T 309.	Portable Testing and Resistance Set, complete with galvanometer, similar to T 308, but with only three rows of coils. Total resistance, 1,110 ohms; range, .001 to 1,000,000 ohms.....	75.00

For use with our Portable Testing Sets we recommend the Burnley-Wood Dry Cell Batteries, see page 411.

# STANDARD RESISTANCE BOX AND WHEAT-STONE BRIDGE, No. 1.

As Designed by Prof. Anthony.



The coils in this set consist of ten one-tenth ohm coils, ten units, ten tens, ten hundreds, ten thousands, all of platinoid wire—or eleven thousand, one hundred and eleven ohms in all. These coils are arranged in rows, instead of circles, as in the "Dial Pattern," thus greatly facilitating the cleaning of the rubber top between the blocks. Only one plug is required in each row, the coils being so connected that it throws in as many coils of the denomination as may be indicated by the number engraved upon the block.

An advantage gained by placing the coils in rows is the possibility of placing any or all of each denomination in multiple arc as well as in series; thus, in the row marked units, a plug to the right of block 0 and to the left of block 10 gives us the ten coils in series, or ten ohms; while placing plugs at the right of block 0, left of block 1, right of block 2, etc., gives us the same ten coils in multiple arc, or one-tenth of an ohm. This, as is readily seen, makes possible a much more complete inter-comparison of the coils—as *e. g.*, the comparison of the above ten-ohm coils in parallel with the one-tenth coils singly, etc.

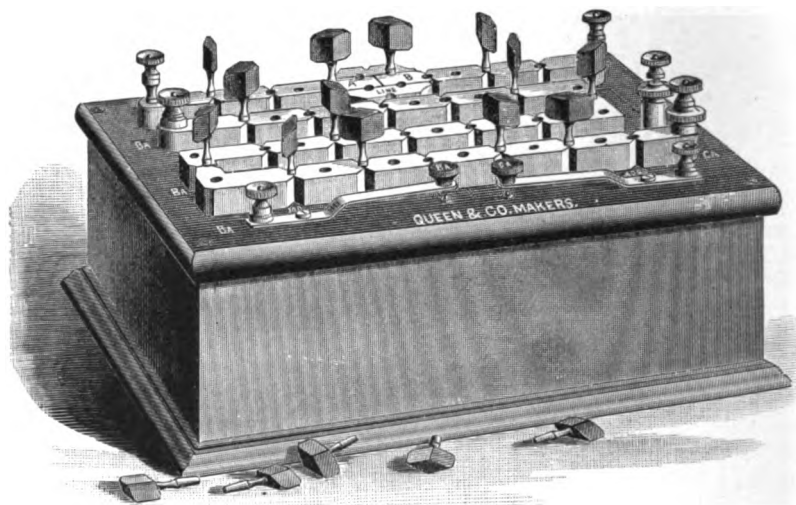
The bridge arms consist of one, ten, one hundred, one thousand, and ten thousand ohms on each side, giving a ratio of one to ten thousand, and a total range of measurement of from one-millionth of an ohm to one hundred and eleven meg-ohms, by taking advantage of the multiple arrangement. By a convenient device, these arms may be quickly interchanged by the simple change of two plugs; an operation only possible in forms hitherto used by the change of wires from one set of binding posts to another, during which time alterations of temperature and of other conditions might take place sufficient to make the two measurements worthless for purposes of comparison, to say nothing of the inconvenience of the operation.

Provided with our "temperature coil," by means of which the temperature of the coils can be much more quickly and accurately determined than by the use of a thermometer. Furnished with certificate and adjusted within  $\frac{1}{100}$  of one per cent.

Price..... \$400.00

## STANDARD RESISTANCE BOX AND WHEATSTONE BRIDGE, No. 2.

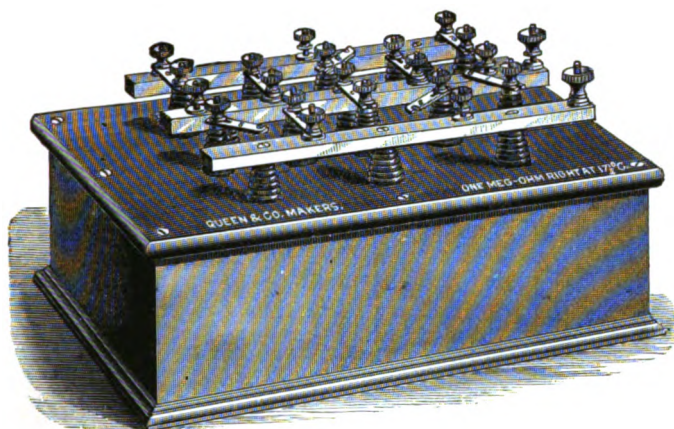
POST OFFICE PATTERN.



Coils of platinoid wire of 0.5, 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1,000, 2,000, 3,000, and 4,000 ohms — total resistance of 11110.5 ohms. The bridge arms are 10, 100, and 1,000 ohms on one side, and 1, 10, and 100 ohms on the other. A reversing arrangement, by which the arms may be interchanged by the simple change of the plugs, gives to these six coils of the bridge all the advantages of eight. Furnished with certificate and adjusted to  $\frac{1}{10}$  of one per cent. Range, .0005 to 11,110,000 ohms.

Price.....\$225.00

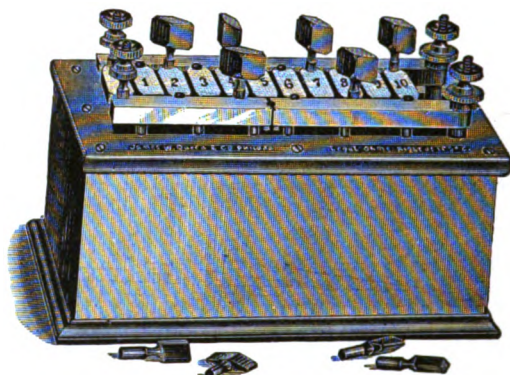
## STANDARD MEG-OHM BOX.



We present a cut of our new Standard Meg-ohm Box, which we consider the finest box of this capacity ever put upon the market. The terminals are all mounted upon corrugated rubber pillars  $1\frac{1}{2}$  inches high, which have an insulating surface of just twice the extent of plain pillars of the same height; the inside of each pillar is cut out so as to *enclose* the terminal rods (to which the wires themselves are soldered) *without touching them*, except at the top, thus making leakage almost an impossibility. The set is composed of ten coils of 100,000 ohms each, each of these being itself made up of four coils connected together under the top, and thus divided for the purpose of securing better insulation. The binding posts may be so connected by means of the metal straps provided for the purpose, as to throw any number of the coils together in series or in multiple. The coils themselves are adjusted to the very highest degree of accuracy, while the mechanical finish throughout is of the very best. This box is heartily recommended to electricians, electric light and power companies, manufacturers of cables and high insulation wire, and all others who require to measure very high resistances, or to test and measure the insulation of cables, wires, and insulating compounds, as being of the very highest accuracy and workmanship.

No. T291. Ten sets of coils of platinoid wire, each set of coils of 100,000 ohms. These may be connected any number in series or in multiple, as desired. Accurate to  $\frac{1}{100}$  of one per cent. Certificate with each box-----each, \$400.00

## STANDARD ONE HUNDRED THOUSAND OHM BOX.



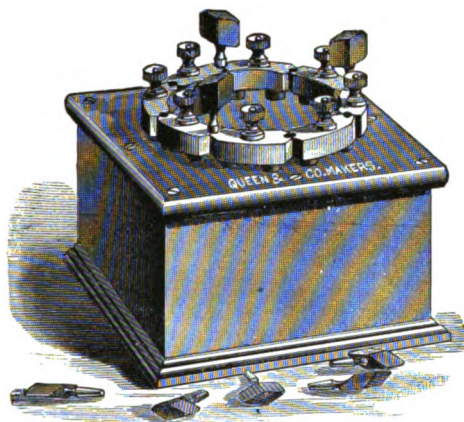
This is another one of our series of high-grade boxes. It presents many features of superiority over any other box of this capacity ever made before. The coils are each 10,000 ohms resistance, and are so connected that only two plugs are needed when using them in series; thus the cut, with plugs in 0 and 7, would represent the box as it would appear with 7,000 ohms in circuit. Another very valuable feature of this box is, that the coils may, any or all of them, be arranged in multiple arc, thus giving the use of a range from 1,000 to 5,000 ohms, or, in all, from 1,000 to 100,000 ohms; for instance, placing the plugs in the holes, top of No. 7, bottom of No. 6, top of No. 5, and so on back to block 0, gives us 7,000 ohms in multiple, or, 1,428 ohms. This box may also be used as a Wheatstone Bridge, if desired, by simply removing plug in middle of long bar, and using the extra binding post as well as the other two posts ordinarily used.

This box is *especially designed* for use in tests of high resistances, insulation resistances, etc., and is made in such a way as to reduce the leakage in the box itself to the very smallest possible quantity. The long bars, as well as the smaller blocks, are all raised above the rubber top of the bridge, and supported by small, highly polished rubber washers, a quarter of an inch thick, thus making the surface of contact between the brass work and the top of the box exceedingly small, and making the insulation of the blocks from each other many times greater than in the form as ordinarily made.

The coils in this box, as well as in our other high-grade boxes, are all made of platinoid wire, and are guaranteed accurate to within  $\frac{1}{100}$  of 1 per cent. They are mounted in highly finished mahogany cases, 11x6x6, with heavy rubber top of the finest finish, and are of the most careful and durable workmanship throughout.

No. T 292. Each coil of 10,000 ohms resistance. They may be connected, any number, in series or multiple, as desired. Accurate to  $\frac{1}{100}$  of 1 per cent. .... each, \$125.00

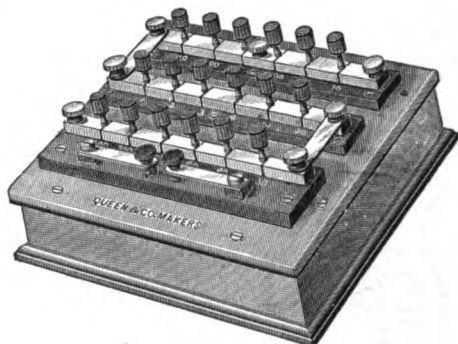
## STANDARD RESISTANCE BOXES.



**T 293. STANDARD ONE HUNDRED THOUSAND OHM BOX. FOUR COILS.**

- No. T 293. The above represents another of our Standard Resistance Boxes, of a somewhat smaller range of usefulness than the preceding. The coils are, in this box, but four in number, viz.: of 40,000, 30,000, 20,000, 10,000 ohms resistance respectively; each coil is separated from the next by an infinity plug, so that, if desired, it may be used alone without the increase of resistance arising from the interpolation of the other brass blocks. The terminal blocks in this box, as in the last, are mounted upon rubber washers, but the plan of the box is such as to allow of using the coils, but in series only. The coils are of platinoid and adjusted, as in the other sets, to the very highest accuracy.....\$ 75.00
- “ T 294. Standard Resistance Box, total capacity 11,110 ohms, in 16 coils as follows: 1, 2, 2, 5, 10, 20, 20, 50, 100, 200, 200, 500, 1,000, 2,000, 2,000, 5,000. The coils are wound with platinoid wire and guaranteed accurate to  $\frac{1}{10}$  of one per cent..... 125.00
- “ T 295. Standard Resistance Box, total capacity, 1,110 ohms, in 12 coils, as follows: 1, 2, 2, 5, 10, 20, 20, 50, 100, 200, 200, 500. The wire used is platinoid, and the coils are accurate to  $\frac{1}{10}$  of one per cent..... 100.00
- “ T 296. Standard Wheatstone Bridge, with four pairs of coils, viz.: 1, 10, 100, and 1,000 ohms on each arm. The coils are wound with platinoid wire, and are guaranteed accurate to  $\frac{1}{10}$  of one per cent..... 100.00

## RESISTANCE BOXES FOR ORDINARY TESTING.



T 304.

- No. T 302. Resistance Box of 12 coils, viz.: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, and 400 ohms; 1,110 ohms in the aggregate. The coils are of German silver, carefully adjusted, and guaranteed correct to  $\frac{1}{4}$  per cent. Mounted in handsome mahogany box, with rubber top, similar to T 304. .... \$30.00
- " T 303. Resistance Box of 16 coils; same as T 302, with addition of four coils of 1,000, 2,000, 3,000, and 4,000 ohms; 11,110 in the aggregate. Of German silver, and guaranteed correct to  $\frac{1}{4}$  per cent. .... 40.00
- " T 304. Wheatstone's Bridge and Resistance Set. This Box has been especially designed to meet demand for a reliable and conveniently arranged Wheatstone's Bridge and Resistance Set, which would have a wide range and yet be inexpensive. The bridge coils are six in number, and are 10,100, and 1,000 ohms on each side; the coils in the rheostat arm are 12 in number, and of the same denomination as those in T 302. The total range of measurement is, therefore, from  $\frac{1}{100}$  of an ohm to 111,000 ohms. Separate keys, properly connected, for battery and galvanometer, are mounted on the same top with the set. Accurate to  $\frac{1}{4}$  per cent. .... 40.00

## THE CLARK STANDARD CELL.



The most convenient and permanent cell, and the one universally recognized as the standard of electro-motive force.

No. 2523 ..... each, \$4.00

## BURNLEY-WOOD TESTING BATTERY.



The short life and frequent troubles attending the use of even the best portable Testing Batteries heretofore on the market, have led us to design the battery which is offered herewith. The cells contained in this battery are the well-known Ajax cells, of a small size, but having the characteristics in power and long life of the Ajax batteries. The size,  $3\frac{1}{4} \times 1\frac{1}{2}$ , makes them very light and smaller than the larger size Silver Chloride battery, which is so well known. While not intended for such work, one of these baby cells will ring a 4-inch bell, and when used for the purpose for which they are intended, they can be relied upon to give excellent results. The connection and arrangement of the batteries in the box will be found superior for convenience and reliability. Flexible cords are provided with tips for selecting one or several batteries from any portion of the series. If one cell or a few should be used harder than the others, they can easily be removed when worked out, and replaced without difficulty and without interfering with the use of the remainder of the cells. A reverser is placed in the lid of the box, *when so ordered*, fitting the cells perfectly for use as a physician's battery, and also making it more useful for certain electrical tests. As a physician's battery, the outfit will be found much superior to any which can be had of the same size and weight, owing to the constant and high electro-motive force and the large amount of current which can be obtained.

No. 2675.	12 Cell	.....	each, \$25.00
" 2677.	24 "	.....	" 45.00

## CHLORIDE OF SILVER BATTERY.



Attention has been given to every detail and these batteries will be found durable. They are provided with a commutator switch or pole changer.

The battery box is of the finest selected mahogany, with piano finish and unbreakable joints.

No. 2524.	6 Cell	.....	each, \$12.00
" 2525.	12 "	.....	" 20.00
" 2526.	16 "	.....	" 27.00
" 2527.	24 "	.....	" 45.00
" 2528.	32 "	.....	" 65.00
" 2529.	50 "	.....	" 95.00

No. 2527, 24 Cell, is the one ordinarily used with Testing Sets.

## POCKET TESTING SET.

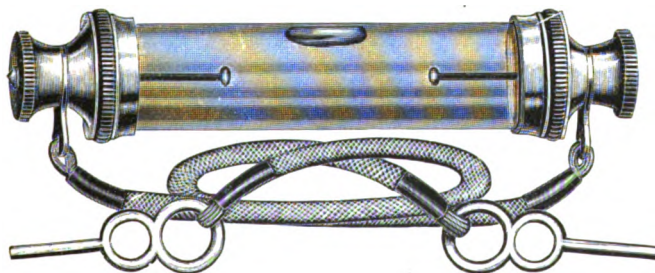


This instrument comprises a sensitive galvanometer and a battery and key with suitable terminals. The whole outfit is small enough to be carried conveniently in the hip pocket. It is flat on both sides, and the binding posts are recessed, making it easy to handle and not liable to breakage. It will give a decided deflection through a resistance of 100,000 ohms or more. We recommend this testing set for all cases where something better than a magneto is required, and where an exact measurement, such as can be made with a bridge, is not necessary.

No. 2522.....each, \$20.00

## IMHAUSER POLE INDICATOR.

30,000 OHMS RESISTANCE.

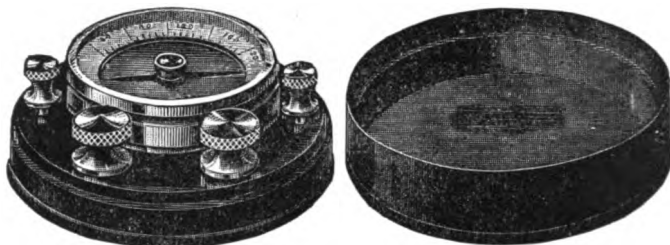


Cut Full Size.

The object of this instrument is to ascertain the direction of electric currents, whether on arc or incandescent circuits, fire and house, telegraph, accumulator, telephone, and all other electric circuits. This indicator will not be injured by being brought in close proximity to a dynamo.

No. 2520.....each, \$3.00

## POCKET GALVANOMETER.



Cut Full Size.

No. 2518..... each, \$4.00

## SENSITIVE GALVANOMETER.



This instrument is designed for the utmost possible sensitiveness obtainable in a small portable galvanometer. It is made with more skill and care than is usually bestowed on this class of work. It will be found very satisfactory for insulation testing, and for other work requiring a sensitive instrument that is not too delicate for ordinary hands. Resistance about 1,000 ohms.

No. 2516..... each, \$15.00

## MAGNETO TESTING BELL.



For ringing up lines and testing for grounds and crosses. Will ring through 20,000 ohms.

No. 655 ..... each, \$7.50  
 “ 655H. With handle ..... “ 8.00

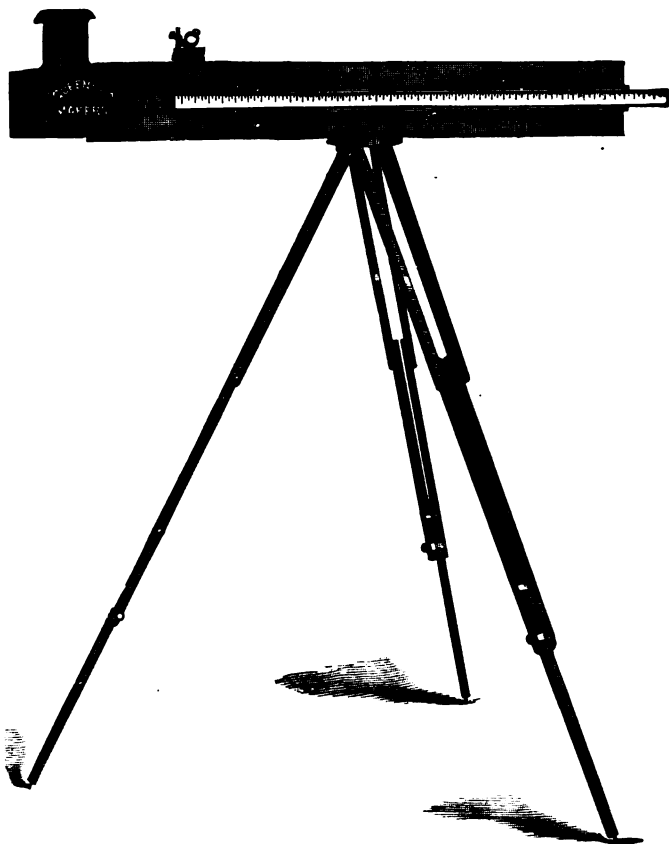
## MAGNETO SIGNALING BELL.



For signaling purposes, and testing short lines. Will ring through 3,000 ohms.

No. 656 ..... each, \$5.00

## PORTABLE PHOTOMETER.



No. 2799.....each, \$37.50

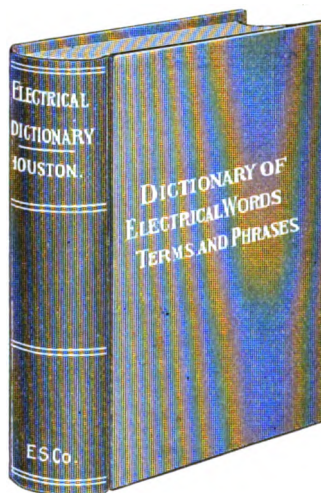
### MISCELLANEOUS.

HEREIN we show some goods taken from the catalogues of other departments of our business, and which are of particular interest and importance.

For complete list of Electric Railway Goods, we refer you to our Railway Catalogue, No. 31.

A full list of our House Goods may be found in our House Goods Catalogue, No. 44 A.

## BOOKS.



The following list includes only those books which are considered most valuable for the practical worker, omitting a large number whose value is chiefly historical, and a smaller number which are so abstruse as to be seldom called for. We will furnish at market price any book which it is possible to obtain.

We have printed in heavy type the titles of a few, which we recommend particularly to any buyers who may wish to have their own judgment supplemented by ours.

**Abernethy, J. P.** *An Outline of Commercial and Railway Telegraphy, in Theory and Practice*, arranged in Questions and Answers. 12mo. Illustrated. Sixth edition, Cleveland, 1891. Cloth. Reprinting ..... **\$2.00**

**Atkinson, Phillip.** *The Elements of Electric Lighting*. Including Electric Generation, Measurement, Storage, and Distribution; Sixth edition, 104 illustrations, 260 pages, 12mo. Cloth. New York, 1890 ..... **1.50**

*Elements of Static Electricity*, with full description of the Holtz and Toepler machines and their mode of operating. 65 illustrations, 12mo. Cloth. New York, 1891 ..... **1.50**

**AYRTON, W. E.** **Practical Electricity.** A Laboratory and Lecture Course for first year of Students of Electrical Engineering, based on the

practical definitions of the electrical units. With numerous illustrations. 12mo. Cloth. London, 1889 ..... **\$2.50**

**BADT, F. B.** **The Dynamo Tenders Hand-book.** With 70 illustrations. 16mo. Cloth. Chicago, 1888 ..... **1.00**

**Incandescent Wiring Hand-book.** With 41 illustrations and five tables. Second edition. 12mo. Cloth. Chicago, 1890 ..... **1.00**

A timely book, containing full instructions for incandescent wiring, and complete information concerning methods of running wires, location of safety devices and switches, splices, insulation and testing for faults, wire gauges, general electrical data, calculating size of wires, wiring of fixtures, elevators, buildings, isolated and central station plants.

## BOOKS—Continued.

**Bell Hangers' Hand-book.** 97 illustrations, 12mo. Cloth. Chicago, 1889. \$1.00

Just the book for those engaged in selling, installing or handling electric batteries, electric bells, elevator, house or hotel annunciators, burglar or fire alarms, electric gas lighting apparatus, electric heat regulating apparatus, etc.

**CARHART, Prof. H. S.** *Derivation of Practical Electrical Units.* 12mo. Cloth. Chicago, 1890. .75

**Primary Batteries.** 1.50

**BLAKESLEY, T. H.** *Papers on Alternating Currents of Electricity for the Use of Students and Engineers.* Second edition. Enlarged. 12mo. Cloth. London, 1889. 1.50

**BOTTONE, S. R.** *Electric Bells and all about them.* A Practical Book for practical men, with more than 100 illustrations. 12mo. Cloth. London, 1889. Reduced to .50

**CLARKE, L. and SABINE, R.** *Electrical Tables and Formulæ for the use of Telegraph Inspectors and Operators.* 12mo. Cloth. London, 1871. 5.00

**Classen, Dr. Alex.** *Quantitative Chemical Analyses by Electrolysis, according to Original Methods.* Translated by W. H. Herrick. 8vo. Cloth. Illustrated. New York, 1887. 2.50

**CROSBY, O. T. and BELL, Dr. LOUIS.** *The Electric Railway in Theory and Practice.* This is the first systematic treatise that has been published on the Electric Railway, and it is intended to cover the general principles of design, construction, and operation. Octavo, 400 pages, and 179 illustrations. 2.50

**CULLEY, R. S.** *Hand-book of Practical Telegraphy.* Eighth edition, enlarged. 8vo. Cloth. Many plates. London, 1885. 5.50

**Cumming, L.** *Electricity Treated Experimentally.* For the use of schools and students. New edition. 12mo. Cloth. London, 1890. 1.50

*Introduction to the Theory of Electricity,* with numerous examples. Third edition, with additions. 12mo. Cloth. London, 1885. \$2.25

**DAVIS, CHAS. M.** *Incandescent Wiring Tables,* and other information for the use of electric light wire men. 16mo. Cloth. New York, 1889. .75

**Day, R. E.** *Exercises in Electrical and Magnetic Measurement with Answers.* Third edition. 12mo. Cloth. London, 1885. 1.00

**Deschanel, A. Privet.** *Electricity and Magnetism;* being part 3 of a Treatise on Natural Philosophy. New edition, enlarged. 8vo. Cloth. Illustrated. New York, 1887. 1.50

**DESMOND, CHAS.** *Electricity for Engineers.* A clear and comprehensive treatise on the principles, construction, and operation of dynamos, motors, lamps, indicators, and measuring instruments; also a full explanation of the electrical terms used in the work. With 100 illustrations. 12mo. Cloth. Bridgeport, 1890. 1.50  
Especially adapted for engineers' use.

**Dolbear, Prof. A. E.** *The Telephone.* An account of the phenomena of electricity, magnetism, and sound, as involved in its action, with directions for making a speaking telephone. 18mo. Cloth. Illustrated. Boston, 1888. .50

**Electricity in Daily Life.** A popular account of the science and application of electricity to every-day uses. With 120 illustrations. 8vo. Cloth. New York, 1890. 3.00  
Contents: Electricity in the Service of Man. The Electric Motor. The Electric Railway. Lighting. The Telegraph. Cable Laying. Electricity in Warfare. In the Household. Applied to the Human Body.

**EVERETT, J. D.** *Units and Physical Constants.* Second edition. 12mo. Cloth. London, 1886. 1.25

**EWING'S Magnetism of Iron and Other Metals** 4.00

## BOOKS—Continued.

- FARADAY, M.** *Experimental Researches in Electricity.* Three volumes. 8vo. Cloth. London, 1839-55.....\$20.00
- FISKE, Lt. BRADLEY A., U. S. N.** *Electricity in Theory and Practice, or The Elements of Electrical Engineering.* Fifth edition. 8vo. Cloth. 180 illustrations. New York, 1888..... 2.50  
 Contents: Chapter 1. Magnetism. 2. Frictional Electricity. 3. Work and Potential. 4. Voltaic Batteries. 5. Laws of Currents. 6. Secondary or Storage Batteries. 7. Thermo-Electric Batteries. 8. Electro-Magnetism. 9. Induction Currents. 10. Electrical Measurements. 11. Telegraphy. 12. The Telephone. 13. The Electric Light. 14. Electric Machines. 15. Electro-Motors. 16. Electric Distribution of Power. 17. Meters. 18. Electric Railways.
- FLEMING, J. A.** *Short Lectures to Electrical Artisans.* A course of experimental lectures delivered to a practical audience. Third edition. 74 illustrations. 12mo. Cloth. 1890.. 1.50
- The Alternate Current Transformer in Theory and Practice.** Vol. I. The Induction of Electric Currents. 500 pages, fully illustrated, and with copious index. Second edition. 8vo. Cloth. London, 1890..... 3.00  
 This book treats both practically and theoretically the subject of Electric Current Induction and the Alternating Current Transformer.
- Foote, A. R.** *Economic Value of Electric Light and Power.* 12mo. Cloth. Cincinnati, 1889..... 1.00
- Forbes, Prof. Geo.** *A Course of Lectures on Electricity.* Delivered before the Society of Arts. 82 illustrations. 12mo. Cloth. London, 1887..... 1.50
- Gladstone, J. H., and Tribe, Alfred.** *The Chemistry of the Secondary Batteries of Planté and Faure.* 12mo. Cloth. Illustrated. London, 1883.. 1.00
- GORDON, J. E. H.** *A Practical Treatise on Electric Lighting.* With 23 full-page plates and many illustrations. 8vo. Cloth. London, 1884.....\$4.50  
*Four Lectures on Static Electric Induction.* 12mo. Cloth. Illustrated. New York, 1880..... .80  
*A Physical Treatise on Electricity and Magnetism.* Second edition. Two volumes. 8vo. Cloth. Illustrations and plates. New York, 1883.....10.00  
*School Electricity.* Sources, Currents, Measurement, Telegraphy, Telephony, Lightning, Electrolysis, Induction, etc. 263 pages, with 140 illustrations. 12mo. Cloth. London, 1886..... 2.00
- Gore, G.** *The Art of Electro-Metallurgy, including all Known Processes of Electro-Deposition.* Fourth edition. 12mo. Cloth. Illustrated. New York, 1890. 2.00  
*The Art of Electric Separation of Metals, Theoretical and Practical.* Fully illustrated. 8vo. Cloth. London, 1890..... 3.50
- GRAY, ANDREW.** *Absolute Measurements in Electricity and Magnetism.* Designed to give, as far as is possible within moderate limits, a clear account of the system of absolute units of measurement now adopted. Illustrated. Volume I. 12mo. Cloth. [This is an elaboration of the book following.]..... 3.25  
*Absolute Measurements in Electricity and Magnetism.* Second edition, revised and greatly enlarged. 12mo. Cloth. London, 1889..... 1.25
- Gray, J.** *Electrical Influence Machines.* Containing a full account of their historical development, their modern forms, and their practical construction. Illustrated, 12mo. Cloth. London, 1889..... 1.75
- HERING, CARL.** *Principles of Dynamo Electro Machines.* Practical directions for designing and constructing dynamos. With an appendix containing several articles on allied subjects, and a table of equivalents of units of measurement. With 59 illustrations. 12mo. Cloth. New York, 1888..... 2.50

## BOOKS—Continued.

**Table of Equivalents of Units of Measurements.** 12mo. Paper. New York, 1888.....\$ .50

**Practical Directions for Winding Magnets for Dynamos.** 12mo. Cloth. London, 1887 ..... 1.25

**Universal Wiring Computer**..... 1.00

**HOPKINS, GEO. M. Experimental Science, Elementary, Practical, and Experimental Physics.** 650 illustrations. 8vo. Cloth. New York, 1890..... 4.00

The leading principles of physics are illustrated by simple and inexpensive experiments, and most of the engravings are now for the first time employed in book illustrations.

The design of this work is to afford to the student a ready means of acquiring a general knowledge of physics by the experimental method.

**Hospitalier, E. Domestic Electricity for Amateurs.** Translated from the French. With additions by C. J. Wharton. With illustrations. 8vo. Cloth. London, 1889..... 2.50

**HOUSTON, PROF. E. J. A Dictionary of Electrical Words, Terms, and Phrases.** 656 pages. 397 illustrations. 12mo. Cloth. New York, 1888..... 2.50

**HOUSTON, PROF. E. J. Primers of Electricity.** These thirty-two primers contain chapters devoted to dynamo machines, arc and incandescent lamps, alternating currents, testing instruments, the electric telegraph, the microphone, the telephone, galvanometer, constants, Ohm's law, electric clocks, voltaic batteries, etc. 8vo. Boards. London, 1888..... .75

**JENKIN, FLEEMING. Electricity and Magnetism, with an Appendix on the Telephone and Microphone.** 12mo. Cloth. London, 1887..... 1.25

Contents: Electric quantity, potential, current, resistance, electro-static

measurement, magnetism, magnetic measurements, electro-magnetic measurement, units, chemical theory of electro-motive force, thermo-electricity, galvanometers, electrometers, galvanic batteries, frictional electrical machines, electro-magnetic engines, telegraphic apparatus, speed of signaling, telegraphic lines, useful applications of electricity, mariners' compass, etc., etc. Appendix on the telephone and microphoies, and twenty-seven tables.

**KAPP, GISBERT. Electric Transmission of Energy, and its Transformation, Subdivision, and Distribution.** A practical hand-book. Third edition. 8vo. Cloth. London, 1890.....\$3.00

**KEMPE, H. R. A Hand-book of Electrical Testing.** Fourth edition, enlarged. Thick 12mo. Cloth. London, 1887..... 5.00

**The Electrical Engineer's Pocket Book.** Modern rules, formulæ, tables, and data. 32mo. Leather. London, 1890..... 1.75

The volume is divided into twenty-one sections, as follows: 1. Weights and measures; 2. Units; 3. Temperature; 4. Electro-chemistry, primary batteries and accumulators; 5. Electro-metallurgy; 6. Current; 7. Resistances; 8. Capacity; 9. Galvanometers; 10. Fault testing; 11. Wire; 12. Insulated wire; 13. Electric light leads; 14. Electric light dynamos and motors; 15. Rules and regulations; 16. Telegraph apparatus; 17. Telephones; 18. Miscellaneous; 19. Mathematical tables; 20. Foreign money; 21. Dictionary of technical terms.

**Kennelly, A. E., and H. D. Wilkin-son. Practical Notes for Electrical Students.** Volume I. Laws, units, and simple measuring instruments. 8vo. Cloth. London, 1890..... 2.50

**Langbein, Dr. George. Electro-Deposition of Metals**..... 4.00

## BOOKS—Continued.

- LATIMER, L. H., C. J. FIELD, and J. W. HOWELL.** *Incandescent Electric Lighting.* A practical description of the Edison system, to which is added the design and operation of incandescent stations, by C. J. Field; and a paper on the maximum efficiency of incandescent lamps, by J. W. Howell. 16mo, illustrated. Boards. New York, 1890..... \$ .50
- Lockwood, T. D.** *Electricity, Magnetism, and Electric Telegraphy.* A practical guide and hand-book of general information for electrical students, operators, and inspectors. 8vo. Cloth. 376 pages, 152 illustrations. New York, 1883..... 2.50
- Practical Information for Telephonists.** 12mo. Cloth. New York, 1882..... 1.00
- LODGE, OLIVER J.** *Modern Views of Electricity.* With illustrations. 12mo. Cloth. London, 1889..... 2.00
- Martin, T. C., and T. Wetzler.** *The Electro-Motor and its Applications.* Second edition. 300 illustrations, 4to. Cloth. New York, 1888..... 3.00
- Maver, Jr. Wm., and Davis, M. M.** *The Quadruplex.* With chapters on the dynamo-electric machine in relation to the quadruplex. The practical working of the duplex telegraph repeaters and the Wheatstone automatic telegraph. 63 illustrations, 8vo. Cloth. New York, 1890..... 1.50
- Maxwell, J. C.** *A Treatise on Electricity and Magnetism.* Two volumes, 8vo. Third edition. Oxford, 1881.. 8.00
- McMillan, W. C.** *A Treatise on Electro-Metallurgy.* Embracing the application of electrolysis to the plating, depositing, smelting, and refining of various metals, and to the reproduction of printing surfaces and art work, etc. 12mo. Cloth. London, 1890..... 3.50
- MEADOWCROFT, W. H.** *The A, B, C of Electricity.* 36 illustrations, 12mo. Cloth. New York, 1890 .... .50
- MONROE and JAMIESON.** *Pocket Book of Electrical Rules and Tables.* For the use of electricians and engineers. Sixth edition, revised. 32mo. Leather. Adapted for the pocket. London, 1890..... \$2.50  
Contents: 1. Unit of Measurements. 2. Measures. 3. Testing. 4. Conductors. 5. Submarine Cables. 6. Telegraphy. 7. Electro-Chemistry. 8. Batteries. 9. Dynamos and Motors. 10. Electric Lighting. 11. Miscellaneous. 12. Logarithms.
- Plante, Gaston.** *The Storage of Electrical Energy, and Researches in the Effects Created by Currents Combining Quantity with High Tension.* With 89 illustrations. Translated from the French by Paul B. Elwell. 8vo. Cloth. London, 1887..... 4.00
- POPE, F. L.** *The Modern Practice of the Electric Telegraph.* Thirteenth edition. 8vo. Cloth. New York, 1890..... 1.50  
Contents: Origin of the Electric Current. Electro-Magnetism. Telegraphic Circuits. The Morse or American Telegraphic System. Insulation. Testing Telegraph Lines. Notes on Telegraphic Construction. Hints to Learners. Recent Improvements in Telegraphic Practice. Appendix and Notes.
- Preece, W. H., and Sivewright, J.** *Telegraphy.* (Text Book Science Series) 12mo, illustrated. Cloth. London, 1876..... 1.75
- PRESCOTT, G. B.** *Electricity and the Electric Telegraph.* New edition. Revised and enlarged. Two volumes, 8vo. Cloth. New York, 1885..... 7.00  
*The Electric Telephone.* Second edition, revised and enlarged. 795 pages, 8vo. Cloth. New York, 1890. 6.00  
*Dynamo-Electricity.* Its generation, application, transmission, storage, and measurement. 8vo, with 545 illustrations. Cloth. New York, 1884..... 5.00  
*History, Practice, and Theory of the Electric Telegraph.* New edition, revised and enlarged. 12mo, illustrated. Cloth. Boston, 1875..... 2.50

## BOOKS—Continued.

- Pyncheon, Thos. R.** *Introduction to Chemical Physics designed for the use of Academies, High Schools, and Colleges.* With numerous engravings, and containing copious lists of experiments with directions for preparing them. Third revised and enlarged edition. 12mo. Cloth. New York, 1881.....\$3.00
- Rankine, W. J. M.** *Useful Rules and Tables for Engineers, with Appendix, Tables, Tests, and Formula for the use of Electrical Engineers.* Seventh edition, 12mo. Cloth. London, 1889. 4.00
- Reports of the Committee on Electrical Standards, appointed by the British Association.** Revised by Sir W. Thomson and Prof. J. Clerk Maxwell. 8vo. Cloth. London, 1873..... 3.75
- Robinson, W.** *Gas and Petroleum Engines.* A practical treatise on the internal combustion engine, with numerous illustrations. 8vo. Cloth. London, 1890..... 5.50
- ROSSLEUR, A. A.** **Galvanoplastic Manipulations.** A practical guide for the gold and silver electro-plater and the galvanoplastic operator. Translated from the French by A. A. Fesquet. 8vo, illustrated. Cloth. Scarce. Philadelphia, 1872.....10.00
- Salomons, Sir David.** *Electric Light Installations and the Management of Accumulators.* A practical hand-book. Fifth edition, revised and enlarged. With 99 illustrations, 348 pages, 12mo. Cloth. London, 1890..... 1.50
- Schwendler, L.** *Instructions for Testing Telegraph Lines.* Second edition. Two volumes, 8vo. Cloth. London, 1879-80..... 8.00
- Shaw, Geo.** *A Manual of Electro-Metallurgy.* Second edition, 8vo. Cloth. London, 1844..... 4.00
- Slingo, W., and A. Brooker.** *Electrical Engineering for Electric Light Artisans and Students.* 8vo, with 307 illustrations. Cloth. London, 1890..... 3.50  
Contents: Current, Potential, Conductors, Insulators. Practical Units, Ohm's Law, Fundamental Units. Primary Batteries. Measurement of Current Strength. Measurement of Resistance, Measurement of Electro-Motive Force. Electro-Magnets, Electro-Magnetic Induction. Dynamo-Electric Machines (Alternate Current). Dynamo-Electric Machines (Direct Current). Direct Current Dynamos (Open Coil). Motors and their Applications. Transformers. Secondary Batteries. Arc Lamps. Incandescent Lamps. Photometry. Installation Equipment, Fittings.
- Sloane, T. O'Connor, A. M., E. M., Ph. D.** *Electric Toy Making. Dynamo Building and Electric-Motor Construction.* Very fully illustrated.....\$1.00  
*Electricity Simplified.* Very fully illustrated..... 1.00
- Arithmetic of Electricity..... 1.00**  
The author of this book has been remarkably successful in bringing within the range of non-mathematical readers in a thoroughly scientific manner, subjects, which have hitherto been treated principally with the aid of the higher mathematics. The practical worker as well as the student will find this book one of the few which can not be dispensed with.
- Spon, E.** *Workshop Receipts.* Third series. Devoted to electrics, alarms, batteries, bells, carbons, coils (induction, intensity, and resistance), dynamo-electric machines, measuring, microphones, motors, phonographs, photophones, storage, etc.; metallurgical processes. Fully illustrated and uniform with the two previous volumes. 12mo. Cloth. London, 1884..... 2.00
- SWINBURNE, JAS.** **Practical Electrical Units Popularly Explained.** With numerous illustrations and remarks. 12mo. Cloth. London. (Reprinting.)
- Thomson, Sir Wm.** *Reprint of Papers on Electro Statics and Magnetism.* Second edition. 8vo. Cloth. London, 1884..... 5.00

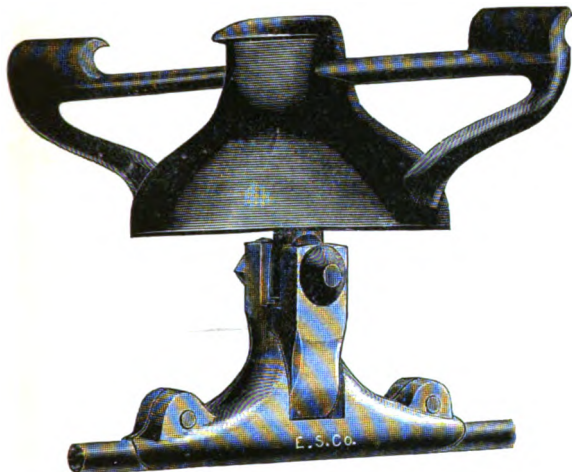
## BOOKS—Continued.

- THOMPSON, SILVANUS P.** *Phillip Reis; inventor of the Telephone; a Biographical Sketch with Documentary Testimony. Translations of the Original Papers of the Inventor, and Contemporary Publications* 8vo. Cloth. 3 plates and 48 engravings. London, 1883.....\$3.00
- Elementary Lessons in Electricity and Magnetism.** 16mo. Cloth. Illustrated. London, 1839..... 1.25
- Lectures on the Electro-Magnet.** 8vo. Cloth. Illustrated. New York, 1891..... 1.00
- The Electro-Magnet.**..... 6.00
- THURSTON, PROF. R. H.** *Stationary Steam Engines, especially adapted to Electric Lighting Purposes.* With many folding plates. 12mo. Cloth. New York, 1884..... 1.50
- Trevert, Edward.** *Experimental Electricity.* Fully illustrated. 12mo. Cloth. Lynn, 1890..... 1.00
- Tyndall, John.** *Notes of a Course of Nine Lectures on Electrical Phenomena and Theories.* 12mo. Cloth. London, 1870..... .50  
*Light and Electricity.* 16mo. Cloth. New York, 1879..... 1.25  
*Lessons in Electricity at the Royal Institution, 1875-6.* 12mo. Cloth. New York, 1881..... 1.00  
*Researches on Diamagnetism and Magneto-Crystalline Action, including the Question of Diamagnetic Polarity.* 12mo. Cloth. New York, 1888..... 1.50
- Urquhart, J. W.** *Dynamo Construction*..... 3.00
- Urquhart, J. W.** *Electro-Plating.* A practical hand-book on the deposition of copper, silver, nickel, gold, aluminum, brass, platinum, etc. With descriptions of the chemicals, materials, batteries, and dynamo-machines used in the art. Second edition. Carefully revised, with additions. 12mo. Cloth. London, 1888.....\$2.00  
*Electric Light; Its Production and Use.* Fourth edition, re-written, with large additions. Numerous illustrations. 12mo. Cloth. London, 1890. 3.00  
*Electric Light Fitting.* A handbook for working electrical engineers. Embodying practical notes on installation management. With numerous illustrations. 12mo. Cloth. London, 1890. 2.00
- Wahl, Wm. H.** *Galvanoplastic Manipulations.* A practical guide for the gold and silver electro-platers and the galvanoplastic operator. Comprising the electro-deposition of metals by means of the battery and the dynamo-electric machine, etc. 189 illustrations, 8vo. Cloth. (Scarce.) Philadelphia, 1883. 7.50
- Watt, A.** *Electro-Deposition.* A practical treatise on the electrolysis of gold, silver, copper, nickel, and other metals and alloys, with descriptions of voltaic batteries. Magnets and dynamo-electric machines. Thermopiles and of the material and processes used in every department of the art, and several chapters on electro-metallurgy. Third edition, revised and corrected. 12mo, illustrated. Cloth. London, 1889..... 3.50
- Wilson, F. J. T.** *Stereotyping and Electrotyping.* A guide for the production of plates by the papiermache and plaster processes, with instructions for depositing copper by the battery or by the dynamo-machine; also hints on steel and brass facing, etc. Illustrated. 12mo. Cloth. London..... 2.00

A FEW SPECIALTIES FROM ELECTRIC RAILWAY CATALOGUE, No. 31.

## E. S. STANDARD TROLLEY WIRE BELL,

With Wood's Improved Clamp.



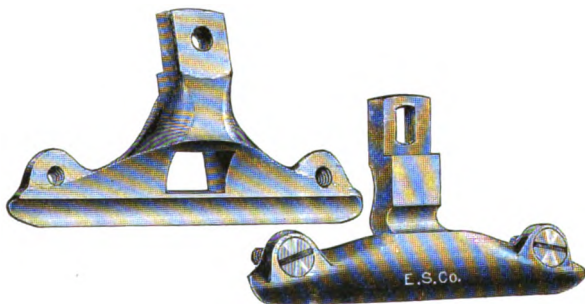
No. 2449. Showing Bell and Clamp Complete.

The bell is manufactured from malleable iron and vulcanized rubber and is much stronger and more durable than any mica or rubber bell can possibly be.

Wood's Improved Clamp is so constructed that when it is used, dropping of the Trolley wire is an absolute impossibility. It is the only clamp that should be used for city work.

The ease with which this clamp can be applied or removed makes it a favorite with all construction men and managers of electric roads.

Complete .....	\$1.50
Bell, only .....	.90
Clamp, only .....	.60



Showing Parts of Clamp.

## WOOD'S SELF-LOCKING POLE RATCHET.

Patent Applied For.



This Ratchet is self-locking, and holds span wire firmly at any position drawn to. The locking attachment renders it impossible for span wire to escape as the result of pole being jarred. Frame is made of steel and is, consequently, very strong.

The Ratchet may be used on the *INSIDE* (or street side) of pole or on the *OUTSIDE* (or sidewalk side) of pole. When used on inside of pole it is necessary to use a lag bolt to hold Ratchet in place; the lag bolt can be passed through opening in frame and through the pole *without removing the wheel*. When used on outside of pole it is not necessary to use any lag bolt, as span wire is passed through hole in pole and opening in back of frame and holds Ratchet firmly against pole. This Ratchet saves money, time, and labor.

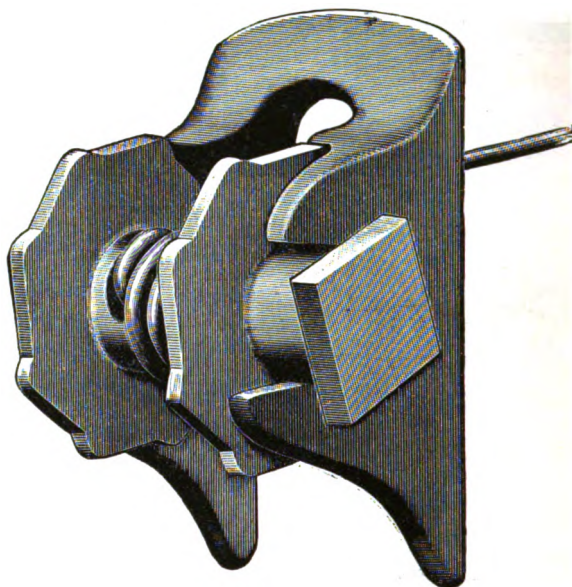
No. 2417 ..... each, \$0.60

For full list of Electric Railway Supplies, see our illustrated Electric Railway Catalogue, No. 31.

A FEW SPECIALTIES FROM ELECTRIC RAILWAY CATALOGUE, No. 31.

## SAFETY SPAN-WIRE TIGHTENER.

Patented.



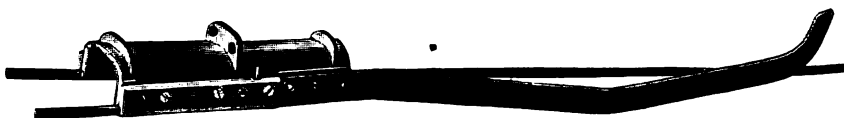
No. 2411.

The cheapest device to be obtained for holding, tightening, slackening, and controlling span wires, guard wires, guy wires, etc.

Send for sample and quotation before making estimates on construction work.

## MCTIGHE OVERHEAD SWITCH.

Patent Applied For.



Perfectly reliable, light, and adjustable for right or left hand turn-outs. Is placed on the wire by clamps, no soldering being required.

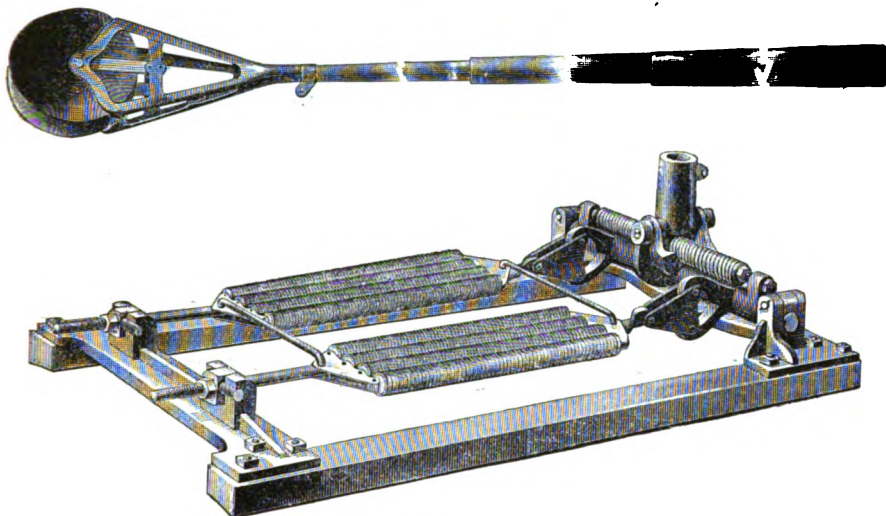
No. 2388 ..... each, \$7.50

For full list of Electric Railway Supplies, see our illustrated Electric Railway Catalogue, No. 31.

A FEW SPECIALTIES FROM ELECTRIC RAILWAY CATALOGUE, No. 31.

## THE BOSTON TROLLEY.

The Electrical Supply Co., Western Agents.



For prices and description, see Electric Railway Catalogue, No. 31, pages 500 to 502.  
 No. 2431. Complete Trolley.....each. \$50.00

## THE C. & D. REED FEED TROLLEY HUB.

The Electrical Supply Co., Exclusive Agents.



No. 4059.

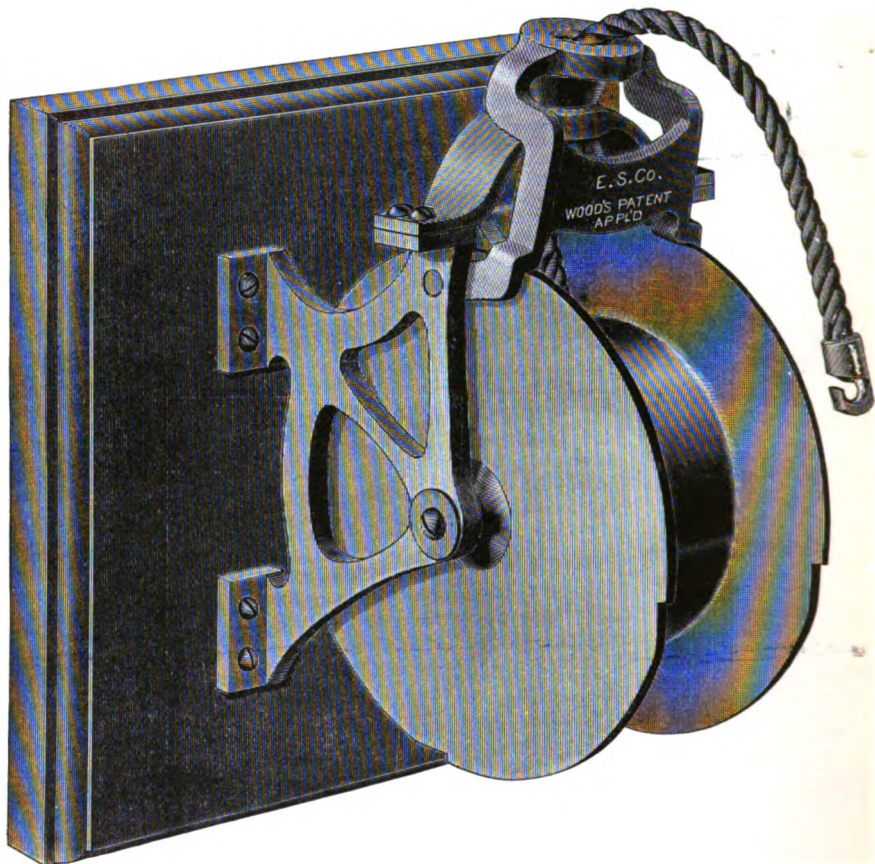
Considerable attention has been given to oiling devices for Trolley Wheels, various forms of hollow axles being arranged, but in all of them the manner of feeding the oil or other lubricant is defective, allowing considerable waste and not preventing wear on the wheel or axle. The construction of the C. & D. Automatic Oiling Axle is entirely original and unique. Advantage is taken of the peculiar porous nature of common reed or rattan. Short sections of this are placed diametrically through the hollow axle, as indicated in the cut. Notches of various sizes are cut into the sticks, admitting the oil to the pores, and allowing it to run outward to the bearing surface. One of the curious properties of this rattan is, that it will feed the heaviest oils perfectly, and never clog up. We supply the rattan with each wheel, already cut to feed a certain number of drops per hour; but purchasers can regulate this to suit themselves, according to the length of run, and the miles per hour made. This automatic feed bears the same relation to Trolley Wheels that the sight-feed does to engine bearings—you can know just what it should do at all times, and depend upon its being done. There is actually no wear between the wheel and axle, consequently the wheel will not wobble or rattle. The oil is renewed through a small hole covered by a spring clip. Prices upon application.

For full list of Electric Railway Supplies, see our illustrated Electric Railway Catalogue, No. 31.

A FEW SPECIALTIES FROM ELECTRIC RAILWAY CATALOGUE, No. 31.

## WOOD'S TROLLEY CATCHER.

Patent Applied For.



Many a trolley wire has been ruined and span wires have been pulled down by allowing trolley wheel to run off the wire and bringing pole in contact with span wires, beams, bridges, etc. By the use of this simple device, the instant the trolley wheel leaves the wire it is pulled down to a position to clear all obstruction. The Trolley Catcher is adjusted automatically as soon as trolley pole has been replaced in position. This Trolley Catcher has been in use since 1889, and has given entire satisfaction wherever used. It is arranged with back-board, to be adjusted to roof of car or dash-board, and can be easily taken off and placed in position at either end of car, or two of them can be used on one car.

No. 4180.....each, \$15.00

For full list of Electric Railway Supplies, see our illustrated Electric Railway Catalogue, No. 31.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## THE DIAMOND CARBON BATTERY.

Patented.



No. 671.

The best liquid battery for electric bells, burglar alarms, annunciators, gas lighting apparatus, telephones, and all open circuit work.

## NOTE THE FOLLOWING FACTS.

1. The Diamond Carbon Battery has greater electro-motive force and less internal resistance than any other open circuit battery.
2. The Diamond Carbon Battery, if short circuited and run down, will come back to its original strength *and is not ruined*. No other battery will do this.
3. The Diamond Carbon Battery is ready for work as soon as charged, requires no attention afterwards, and for simplicity, cleanliness, and neatness, surpasses all others.
4. The Diamond Carbon Battery has an air-tight cover, preventing evaporation.

## PRICES.

Battery, complete.....	each, \$1.25	Zincs, without rubbers.....	each, \$0.10
Jar only .....	" .20	Rubber rings, large .....	" .02
Metal top only .....	" .50	" " small .....	" .01
Metal top with carbons		Sal Ammoniac, per pack-	
complete .....	" .90	age .....	" .15
Carbon sticks only.....	" .06	Sal Ammoniac, per lb. ....	.25

Cases to be charged at the rate of \$1.50 per hundred.

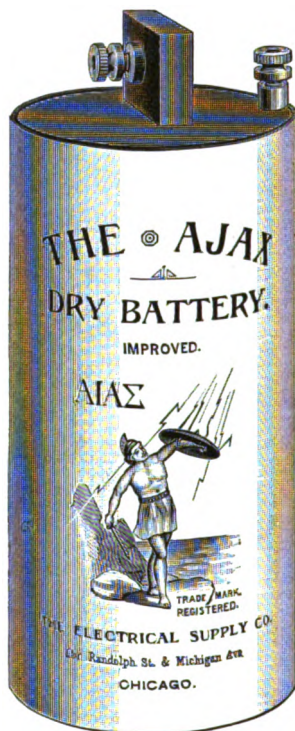
For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## THE AJAX DRY BATTERY.

IMPROVED.

For Electric Bells, Annunciators, Burglar Alarms, and all Open Circuit Work.



No. 664.

E. M. F. 1.5 Volts. Internal Resistance, .3 Ohms.

Current 5 Amperes.

The *best* dry battery ever made. It overcomes all the defects yet encountered; has successfully withstood the severest tests, and we now offer it as the *only* perfect dry battery on the market. The Ajax Dry Battery has greater electro-motive force, less internal resistance, and recuperates more rapidly than any other battery made. No glass jars to break; no solution to prepare; ready for instant work; with ordinary usage will last an indefinite period. Take none but the Ajax.

• Made in one size only; 6 inches high; 2½ inches diameter; weight, 2½ lbs.

No. 664 ..... each, \$1.60

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

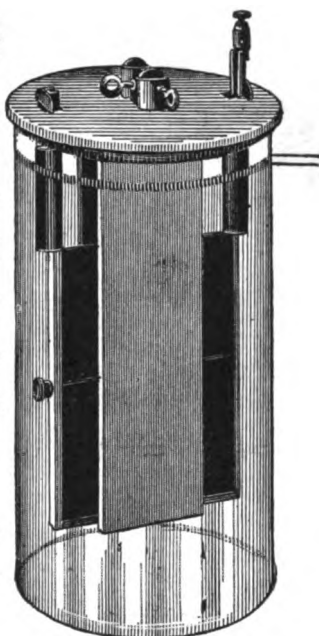
## THE EDISON-LALANDE BATTERY.

This Battery is designed for closed circuit work, in which field it has no equal, for the following reasons :

1. High and constant E. M. F. ( $\frac{8}{10}$  of a volt).
2. No chemical action and consequent loss of material when the cell is idle.
3. Extremely low internal resistance.
4. Cheap materials, easily obtained (copper oxide and caustic potash).
5. No attention or inspection required until all the energy of its elements is exhausted.
6. Convenience of form and freedom from noxious fumes or chemical deposits.
7. Nine different types, adapted to various kinds of work.
8. No other battery so nearly fills all the above conditions as the Edison-Lalande.

## TYPES AND CAPACITY.

Type A—	15	Ampere-hour, small telephone model.
" C—	50	" telephone and annunciator model.
" E—	150	" small telegraph model.
" G—	300	" Western Union telegraph model.
" K—	300	" phonograph model (see cut).
" M—	600	" motor model.
" P—	600	" electric lighting model.
" T—	900	" electric lighting model.
" F—	150	" cautery model.



No. 1414.

Type K, 300 Ampere-hour.

## PRICE LIST OF CELLS AND PARTS.

	TYPE.							
	A	C	E	G	K	M	P	T
Cells, complete, with glass jars	\$1.35	\$2.10	\$3.35	\$4.50	\$4.50	\$12.15	\$8.75	\$11.25
Glass Jar .....	.16	.26	.50	.60	.60	-----	-----	-----
Porcelain Jar .....	-----	.56	.80	1.00	1.30	3.30	3.30	4.20
Porcelain Cover .....	.12	.20	.60	.70	.60	.60	.60	.70
Copper Frame and Bolt .....	.50	.60	.84	.84	.84	1.84	.90	.90
Binding Post, N. P. ....	.24	.24	.36	.36	.36	.70	.36	.36
Rubber Separator, each .....	.10	.10	.10	.10	.10	.10	.10	.10
Rubber Insulator, each .....	.10	.10	.10	.10	.10	.10	.10	.10
Copper Oxide Plate, each .....	.16	.24	.50	.92	.50	.92	.92	1.30
Zinc Plate, each .....	.14	.16	.24	.42	.42	{ $\frac{4}{16}$	.76	1.10
Can Potash (2 sticks) .....	.16	.24	.34	.56	.56	-----	-----	-----
Can Potash (4 sticks) .....	.28	.44	.64	1.04	1.04	1.04	1.04	-----
Can Potash (6 sticks) .....	-----	-----	-----	-----	-----	-----	-----	1.44
Can Potash (8 sticks) .....	.48	.80	1.20	1.92	1.92	1.92	1.92	-----
Bottle Paraffine Oil (1 chg.) .....	-----	.08	.10	.10	.10	.16	.16	.16
Bottle Paraffine Oil (2 chgs.) .....	.08	.10	.16	.16	.16	.24	.24	.24
Bottle Paraffine Oil (4 chgs.) .....	.10	.16	.24	.24	.24	-----	-----	-----

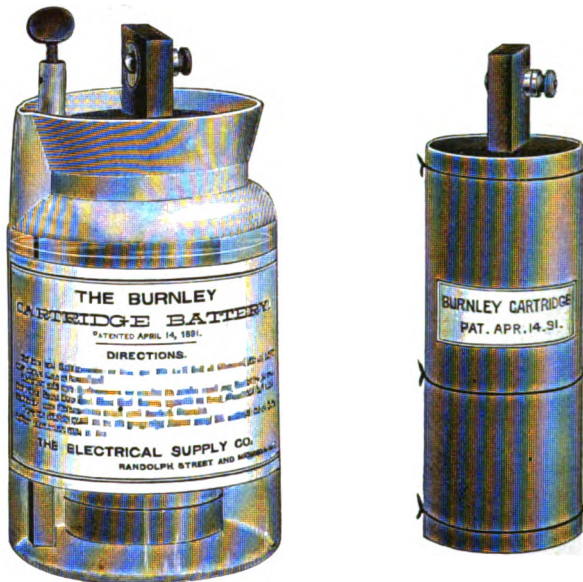
Battery of 8, Type F, 150 Ampere-hour Cautery Model Cells, complete in polished wood case, \$110.00. Send for special circular.

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## BURNLEY CARTRIDGE BATTERY.

For all Open Circuit Work.



No. 666.

The above shows a new and improved form of the Disque Leclanche Battery, patented by Mr. Wm. Burnley, on April 14, 1891, and manufactured by him exclusively for us. It is much simpler in form and smaller than any other battery of this kind. Although it is sold at a much less price, it is at the same time much better and stronger than any similar battery. The porous cup part is so made that it weighs but  $\frac{1}{4}$  as much as the old form, and is entirely free from breakage. The weight of the cartridge only is but  $\frac{3}{4}$  lb., and of the complete battery, including Sal-Ammoniac and zinc,  $4\frac{1}{2}$  lbs. The outside dimensions of the battery are  $3\frac{1}{2}$  inches in diameter by 6 inches high.

## LIST PRICES.

Battery, complete.....	each, \$0.90
Cartridge, only.....	" .60
Zinc, only, with binding screw.....	" .10
Glass Jar, only .....	" .20
Package of Sal-Ammoniac, 3 ounces .....	" .12

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## PHONOGRAPH OR CHROMIC ACID BATTERY.

For Operating Motors, Electric Lighting, and Other Purposes  
Where a Strong Current Is Required.



These batteries are made after the old and well-known pattern which Mr. Edison adopted as being the best for operating his phonograph, and are unquestionably the best design ever placed on the market. They are simply large Grenet batteries made in a convenient and portable form. The glass jar containing the solution and elements is 6 inches in diameter by 9 inches high. This jar is placed inside of a cast-iron jar which is very strong, and, as the glass is secured inside of it by a rubber ring, it is protected from any danger of breakage, and at the same time is made portable. The top, to which is attached the zinc and carbons, is made of hard rubber, and is easily raised, in order to remove the elements from the solution, by sliding up on a steel rod, which is provided with notches to hold it at any desired height. This battery gives 1.9 volts and a current of about 20 amperes. The charge is simply chromic and sulphuric acids, which can be readily obtained at any drug store and is comparatively cheap. The zincs for this battery are thoroughly amalgamated and, with the exception of the chemicals, is the only thing about it which ever requires to be renewed, so that the battery is practically indestructible.

## Price List.

Phonograph Battery, complete.....	each, \$5.00
Glass Jar, 6x9.....	" 1.00
Iron Jar.....	" .75
Hard Rubber Top, complete with Slide.....	" 2.00
Amalgamated Zinc.....	" .60
Carbons, 8½x1½x½ inches (4 to a set).....	" .25
Zinc Supporter and Binding Post.....	" .50
Steel Rod, with Nuts.....	" .40
Platinum Face Carbon Holders (4 to a set).....	" .10
Large Rubber Ring.....	" .15
Chromic Acid.....	per lb., .40
Sulphuric Acid (Commercial), in 9 lb. bottles.....	" .10

**FORMULA FOR CHARGING ONE BATTERY.**—To 4 pounds (or pints) of water, add gradually 1½ pounds (or ¾ of a pint) of sulphuric acid, and stir while doing so, as considerable heat is generated. After this solution has cooled, add ½ pound of chromic acid. When the battery is fully charged, the liquid should fill the jar to a point indicated by the arrows. When the battery is not in use, the elements should always be raised out of the liquid, in order to prevent chemical action and consequent loss of material. *Do not allow the zinc to touch the carbons.*

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

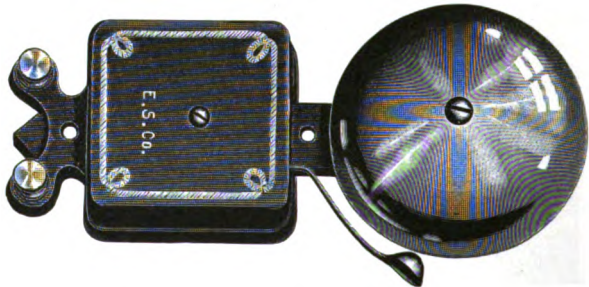
EUREKA WOOD BOX BELL.



No. 611.

Black walnut, cherry, or oak ..... inches, 2½ 3  
Price ..... each, \$1.10 1.20

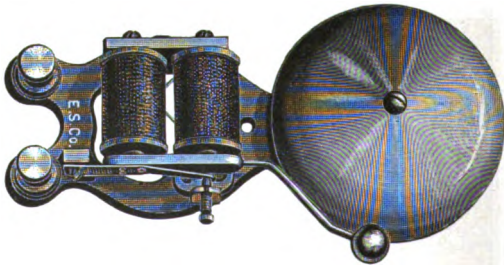
EUREKA IRON BOX BELL.



No. 641.

2½ inch gong ..... each, \$1.00  
3 " " ..... " 1.10

“POPULAR” IRON FRAME BELL.



No. 620.

2½ inch gong ..... each, \$ .90  
3 " " ..... " 1.00  
3½ " " ..... " 1.50  
4 " " ..... " 1.90

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

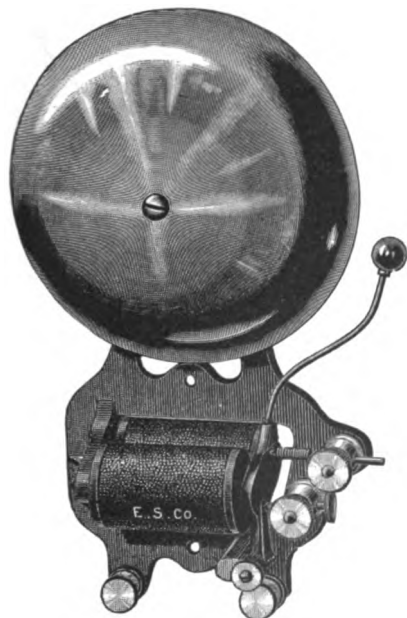
A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

**AJAX IRON BOX BELL.****Patented.**

We offer the Ajax Bell as one entirely novel in conception and construction. Heretofore in making repairs on a bell, and frequently in adjusting it, it has been necessary to disconnect the wires from the binding posts, and take the bell from the wall before making the repairs. In the Ajax Bell it is simply requisite to detach the cap from the bell, leaving the wires connected with the binding posts. The coils and armatures are all contained in the cap, and are readily accessible for repairs, adjustment, or examination. This Bell is a very radical departure from those in common use, and will be found of infinite convenience by the practical bell-hanger. Apart from its convenience, it is made in the best possible manner, with the finest material obtainable, and will be found the most carefully made bell at present on the market.

**No. 646.**

Black walnut, cherry, or oak, 2½ inch.....each, \$1.10.    3 inch.....\$1.20

**No. 635.****ADJUSTABLE IRON FRAME BELL.****NICKEL-PLATED TRIMMINGS.****Patented.**

Is made on an entirely new principle, combining simplicity of construction with durability. It can be changed at will from vibrating to single stroke, by a simple adjustment of the contact-screw. The length of the blow is also under control, so that it can be adapted readily to one or more cells of battery. The trade, and electricians generally, will find that this bell meets all requirements.

5 inch gong.....	each, \$ 7.50
6 " " .....	" 8.30
8 " " .....	" 20.00
10 " " .....	" 23.00
12 " " .....	" 30.00

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

## A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.



No. 500.

HARD-WOOD PUSH  
BUTTONS.

- No. 500. Cherry, ash, oak,  
maple, and birch .....each, \$0.15
- “ 500. Black walnut, ma-  
hogany ..... “ .20
- “ 500. Rosewood, coco-  
bolo ..... “ .30

ORNAMENTAL BRONZE  
PUSH BUTTONS.

- No. 540. Light, solid cap, each, \$0.50
- “ 540 B. Black inlaid,  
solid cap ..... “ .50



No. 540.



No. 510.

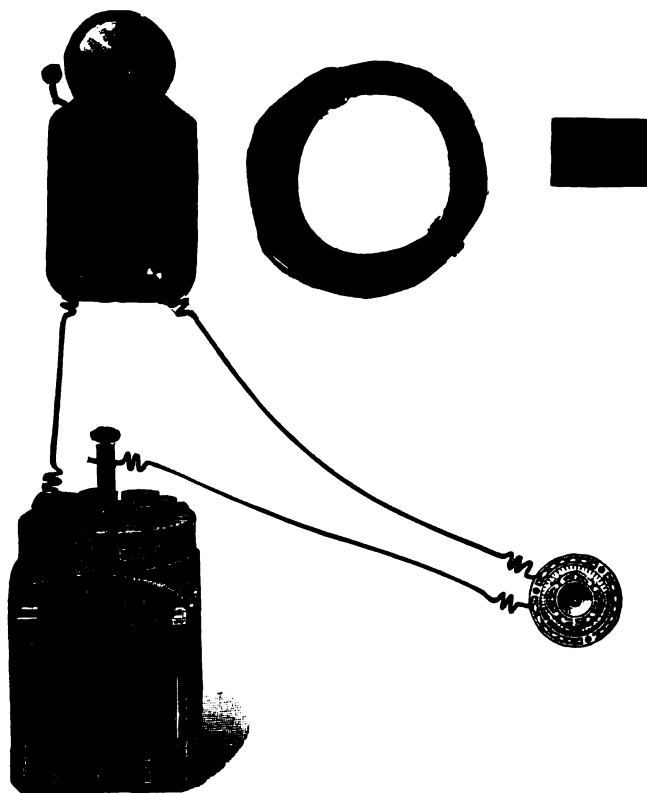
## SCREW CAP.

- No. 510. Light ...each, \$0.80
- “ 510 B. Black, in-  
laid .....each, .80

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## ELECTRIC BELL OUTFITS.



Outfit No. 5001.

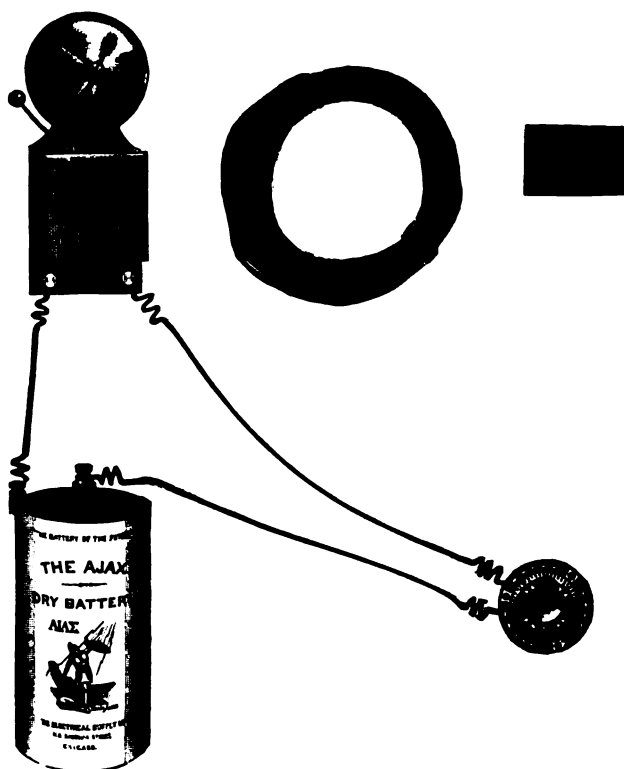
Outfit No. 5001 contains : One No. 510B Ornamental Bronze Push; one No. 610 3-inch B Walnut Box Bell; one No. 671 Diamond Carbon Battery; one hundred feet Insulated Wire; Screws, Tape, and Staples. Packed in box ready for shipment.

Each.....\$4.50

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## ELECTRIC BELL OUTFITS

*Continued.*

OUTFIT No. 5036.

Outfit No. 5036 contains: one No. 664 Ajax Dry Battery; one No. 611 Eureka Wood Box Bell, 3 inch; one No. 540 Bronze Push; one hundred feet Insulated Wire; screws, tape and staples.

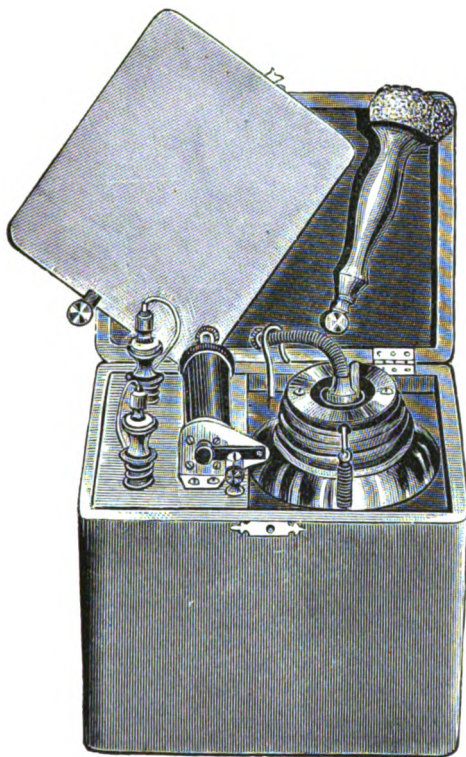
Packed in box ready for shipment.

Price ..... each, \$5.20

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## THE UNIQUE ELECTRO-MEDICAL APPARATUS.



No. 1428.

Constructed upon the most improved scientific principles. Designed for professional and private use.

First-class electro-medical outfit, which is without question the most practical, reliable, durable, and cheapest apparatus of the kind yet offered.

The apparatus is neatly and compactly built, and all parts fit to a nicety, thus making a most convenient and portable article. The instrument is handsomely nickel-plated and placed in a finely-finished mahogany box, with handle on top for carrying.

With the apparatus, we furnish all the necessary electrodes, such as nickel-plated handles, sponge-holder, foot-plate, silk cords, and complete directions and instructions for operating and applying electricity.

The battery used is the Grenet, which is simple in form, and always ready for use.

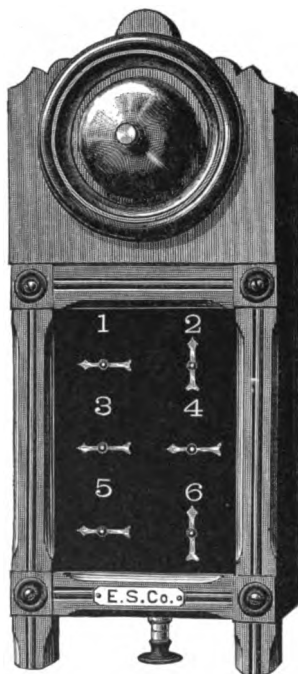
The battery can be kept charged for months, and is always ready for use by simply depressing the zinc rod.

Apparatus, complete.....\$12.00

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

## A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## NEEDLE ANNUNCIATOR.



No. 682.

An excellent Annunciator in every respect. The needles and parts require no adjustment and it never fails to promptly respond to the current.

Furnished in oak, ash, walnut, or cherry, with each needle lettered or numbered, as desired.

No. of Needles.....	3	4	5	6	8	10	12
Complete .....	\$ 7.00	8.00	10.00	12.00	16.00	20.00	24.00
No. of Needles.....				15	16	18	20
Complete.....				\$30.00	32.00	36.00	40.00

Over 20 numbers, \$1.80 per number.

Three to ten Needle Annunciators carried in stock. Larger sizes made to order on short notice.

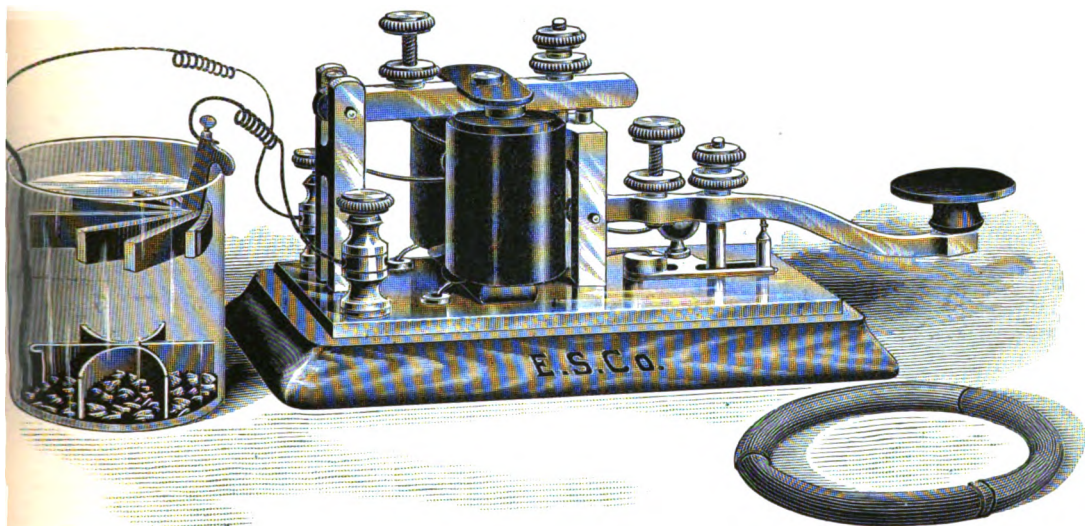
Write for prices on Hotel Annunciators, with or without return call and fire alarm attachment. We are prepared to furnish these from 10 numbers up to 300, and guarantee a first-class article.

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## UNIQUE LEARNER'S TELEGRAPH SET.

Patented Feb. 14, 1888.



No. 2650.

This is our Combination Set, designed for learners, but, with a 20-ohm instrument, may be used with excellent results on private lines from a few feet up to twenty miles in length.

It consists of a beautifully finished sounder and key, mounted on a solid mahogany base. The metal parts are highly finished and lacquered; the key is nickel-plated. The coils are covered with polished hard rubber. Contact points of platinum, insuring perfect and reliable signals.

The battery sent with it is the regular W. U. Gravity pattern, consisting of a 5x7 glass jar, with Crowfoot zinc, copper, and one-half pound of blue vitriol.

We also send one-half pound (fifty feet) of No. 16 double braided and paraffined office wire, with a book of instructions, all packed in a neat box ready for shipment.

This is certainly the best and cheapest set ever offered.

No. 2650.	Unique outfit complete, as shown in cut.....	\$5.25
" 2650.	Unique instrument only, wound for short lines.....	4.50
" 2651.	Unique instrument only, wound for 20 ohms, to be used on long lines from 1 to 15 miles, net .....	5.00

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

## A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## SWITCHES.

Round Wood Base.



No. 700.

No. of Points.....	1	2	3	4	5	6
Each .....	\$0.40	.50	.60	.70	.80	.90

## MIDGET SWITCHES.

Round Hollow Wood Base.

No. 701.

No. of Points.....	1	2	3
Each .....	\$0.25	.30	.35

## OBLONG HARD RUBBER BASE.

Nickel-plated Trimmings.



No. 730.

No. of Points.....	1	2	3	4	5	6	7	8	9
Each .....	\$0.70	.84	.98	1.18	1.40	1.76	2.60	3.00	3.75

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

**SHIELD BRAND MOISTURE-PROOF HOUSE WIRE.**

Superior in insulation to any other House Wire. Especially manufactured by us and recommended for this use. Where this wire passes through walls the insulation will not be rotted away, nor will it ever be disturbed by rats.

Nos. ....	12	14	16	18
Per pound .....	\$0.42	.43	.44	.45

Furnished on 10-pound spools only.

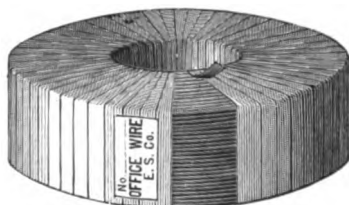
**OFFICE WIRE.**

Double Braided and Paraffined.

Nos. ....	12-14	16-18
Per pound .....	\$0.38	.40

12 and 14 furnished in coils containing 10 to 30 pounds.

16 and 18 furnished on spools containing 5 to 10 pounds.

**ANNUNCIATOR OR BELL WIRE.**

Double Covered and Paraffined.



Nos. ....	16-18	19-20
On 5-pound spool, per pound, \$	0.39	.42
" 10-pound " " "	.37	.40

No. 18, about 150 feet to pound.

" 20, " 250 " " "

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

A FEW SPECIALTIES FROM HOUSE GOODS CATALOGUE, No. 44 A.

## SAL AMMONIAC.

IMPORTED.



This is decidedly *the best* Sal Ammoniac ever offered to the electrical trade. It has been thoroughly tested, and being 99 per cent. pure, is at least 10 per cent. purer than any other sal ammoniac in the market. It is directly *imported* by us.

In boxes, sufficient for one charge.....each, \$0.16  
 In bulk, per pound......25  
 " " barrel.....market prices.

## BLUE VITRIOL.

BEST QUALITY. BOTTOM PRICES.



We solicit orders for *any quantity*, large or small.

In bulk, per pound.....\$0.15  
 " barrel lots.....market prices.

## CHROMIC ACID.

In 10-pound cans, per pound.....\$0.30

## SULPHURIC ACID.

In any quantity, per pound.....\$0.15  
 9-pound bottles, "......10

For full list of House Goods, see our illustrated House Goods Catalogue, No. 44 A.

## TABLES AND FORMULÆ

Of General Importance and Interest to Electricians and Those  
Engaged in Electrical Work.

The following pages are devoted to tables and formulæ, originally compiled by the highest electrical authorities, and now presented with such modifications as are suggested by the latest knowledge and investigation.

We would call particular attention to the "Copper Estimating Curves for Three Wire Work," given on the authority of Mr. H. Ward Leonard; the "Diagram for Wiring Calculations," by Carl Hering; Mr. A. E. Kennelly's "Determinations on the Heating of Conductors Under Practical Conditions," and the tables of Limiting Currents deduced therefrom; the rules adopted by Mr. J. I. Ayer for the guidance of his station and outside employes, which will be found worthy of careful attention, and give a glimpse of the methods which have resulted in the highest efficiency yet reached in this class of work; Prof. H. S. Carhart's concise and simple statement of "Electrical Quantities and Relations" will be valued by very many who appreciate such information and have not the time to follow up the rather voluminous electrical literature of the present day.

The other information given in this section is nearly all new with this edition of our Catalogue, and has been carefully selected from a large mass of such data. All of this matter will prove of inestimable value to those with whom it is new, and a ready reference to those who are already familiar with electrical formulæ. We feel assured that this portion of our Catalogue, particularly, will meet with quick appreciation.

# INDEX

## TO TABLES, FORMULÆ, AND GENERAL INFORMATION.

	Page.
Table of dimensions and Resistances of Pure Copper Wire, by American Gauge .....	447
Comparative Table of Diameter and Weight of Copper Wire.....	448
Galvanized Iron Wire.....	449
Platinum Wire :.....	449
Weights of Iron, Steel, Copper, and Brass Wire.....	450
Iron Pipe Sizes.....	451
Table of Decimal Equivalents in Parts of an Inch.....	452
The Metric System.....	452
Simplified Copper Wire Equations.....	453
Amount of Drop in Wires with a Given Current.....	453
Tables of Limiting Currents.....	454
Wiring Table for 50-Volt, 16 Candle-power Lamps.....	455
Wiring Table for 110-Volt, 16 Candle-power Lamps.....	456
Horse-Power Equivalents.....	457
Equivalents of Wires, Brown & Sharpe Gauge.....	457
Weight of Three-Wire Mains, per 16 Candle-power, 50 Watt, 110-Volt Lamp .....	458
Weight of Three-Wire Feeders, per 16 Candle-power, 50 Watt, 110-Volt Lamp .....	459
Weight of Three-Wire Feeders, per 16 Candle-power, 50 Watt, 110-Volt Lamp .....	460
Circular Mils in Three-Wire Mains, Platted for 1 16 Candle-power, 50 Watt, 110-Volt Lamp.....	461
Circular Mils in Three-Wire Feeders, Platted for 1 16 Candle-power, 50 Watt, 110-Volt Lamp.....	462
Circular Mils in Three-Wire Feeders, platted for 1 16 Candle-power, 50 Watt, 110-Volt Lamp.....	463
Wiring Tables, by Carl Hering.....	464-470
Systems of Distribution of Electrical Energy.....	471-472
Electrical Units and Measurements.....	473-474
Instructions to Employes of Electric Lighting Plants.....	475-477

# TABLE OF DIMENSIONS AND RESISTANCES OF PURE COPPER WIRE.

American or Brown & Sharpe Gauge.	Diameter, Mils.	AREA.		WEIGHT AND LENGTH, SP. GR. 8.9.			RESISTANCE @ 75° F.				Log <i>d</i> <sub>2</sub> .	Log <i>R</i> .
		Circular mils (d <sub>2</sub> = .001 in.)	Square mils (d <sub>2</sub> x .7854)	Lbs. per 1,000 ft.	Lbs. per mile.	Feet per lb.	R, Ohms per 1,000 feet.	Ohms per mile.	Feet per Ohm.	Ohms per lb.		
0000	460.000	211600.00	166190.	639.33	3375.7	1.56	.04006	.25063	39883.	.000776736	5.3255157	2.6907235
000	409.640	167805.00	131790.	507.01	2677.0	1.97	.06186	.32664	16165.	.000712089	5.3248000	2.7914892
0	354.800	125079.40	104520.	402.09	2123.0	2.49	.07801	.41187	12820.	.000194232	5.1241128	2.8921264
0	324.950	105592.50	82932.	319.04	1684.5	3.13	.09831	.51909	10409.	.000307722	5.0266310	2.9926382
1	289.800	83994.20	65733.	252.88	1335.2	3.95	.12440	.65490	8062.3	.00048994	4.9249553	3.0635439
2	257.630	66373.00	52130.	200.54	1058.8	4.90	.15840	.82582	6393.7	.00078015	4.7821901	3.1694578
3	229.490	52634.00	41339.	159.03	839.68	6.29	.19723	1.0414	5070.2	.0012406	4.7321994	3.2649728
4	204.310	41742.00	32784.	126.12	665.91	7.93	.24869	1.3131	4021.9	.0019721	4.6359733	3.3666659
5	181.940	33102.00	25998.	100.01	528.05	10.40	.31361	1.6358	3188.7	.0031381	4.5186542	3.4668500
6	162.020	29020.00	20617.	79.32	414.81	12.61	.39546	2.0681	2528.7	.0048958	4.4191900	3.571062
7	144.280	20816.00	16349.	62.90	332.11	15.90	.49871	2.6331	2005.2	.0072934	4.3183073	3.6784119
8	128.400	16569.00	12966.	49.88	263.37	20.05	.62881	3.3201	1591.3	.0120053	4.2177208	3.7885184
9	114.490	13594.00	10284.	39.16	208.88	25.28	.79281	4.1860	1260.0	.020042	4.1170723	3.8901669
10	101.890	10981.00	8153.2	31.37	165.63	31.38	1.0163	5.2890	1000.0	.031380	4.0162892	4.0000000
11	90.742	8824.00	6467.0	24.88	131.37	40.20	1.3607	6.6588	793.18	.050682	3.9156109	4.1007283
12	80.808	6929.40	5128.6	19.73	104.18	50.69	1.8598	8.3940	620.62	.080585	3.8140065	4.2013827
13	71.961	5178.40	4067.1	15.65	82.632	63.91	2.5047	10.585	498.83	.12841	3.7141956	4.3020436
14	64.064	4106.80	3146.9	12.41	65.525	80.50	3.3008	13.680	385.97	.20880	3.6279777	4.4044115
15	57.068	3256.7	2557.8	9.84	51.956	101.63	4.3160	16.477	321.92	.31658	3.5127778	4.4934614
16	50.820	2582.9	2028.6	7.81	41.237	128.14	5.6083	21.221	248.81	.51501	3.4121070	4.6041316
17	45.257	2048.2	1608.6	6.19	32.683	161.59	7.3911	26.761	197.30	.81600	3.3113724	4.7048668
18	40.303	1624.3	1275.7	4.91	25.925	203.76	9.8911	33.745	156.47	1.3023	3.2106692	4.8056730
19	35.350	1262.4	983.64	3.78	20.051	264.26	13.263	43.765	120.64	2.1904	3.0977431	4.9184961
20	31.961	1021.5	802.28	3.09	16.315	324.00	16.763	53.658	98.401	3.2926	3.0042884	5.0270008
21	28.462	810.10	636.25	2.45	12.936	408.56	22.815	67.660	78.037	5.2355	2.9085386	5.1077006
22	25.347	642.70	505.78	1.94	10.243	515.15	30.377	85.283	61.911	8.3308	2.8080089	5.2082309
23	22.571	509.45	400.12	1.54	8.1312	649.66	40.377	107.59	49.067	13.298	2.7071016	5.3001376
24	20.100	404.01	317.31	1.22	6.4416	819.21	55.695	135.67	38.918	21.050	2.6083921	5.4068471
25	17.900	329.40	254.64	.97	5.1216	1032.96	74.300	171.07	30.864	33.460	2.5036925	5.505467
26	15.940	254.01	199.50	.77	4.0556	1302.61	104.868	215.79	24.469	53.295	2.4048508	5.6113884
27	14.105	201.50	158.26	.61	3.2208	1642.55	151.519	272.02	19.410	84.644	2.3042751	5.7119641
28	12.611	159.70	125.40	.48	2.5344	2071.23	204.906	343.02	15.393	134.56	2.2035496	5.8126806
29	11.257	136.72	99.526	.38	2.0064	2611.82	261.921	432.54	12.207	213.96	2.1028432	5.9133940
30	10.053	109.05	78.953	.30	1.5840	3293.97	330.30	545.30	9.612	340.25	2.0210661	6.0140731
31	8.928	79.71	62.004	.24	1.2672	4132.22	417.27	671.99	7.8673	528.45	1.9015128	6.1147264
32	7.950	63.30	49.637	.19	1.0032	5236.66	523.66	867.37	6.0890	890.33	1.8007171	6.2155221
33	7.080	50.13	39.372	.15	.7920	6602.71	660.27	1093.4	4.8290	1397.3	1.7000977	6.3161415
34	6.304	39.74	31.212	.12	.6336	8298.30	829.33	1379.3	3.8281	2175.5	1.5962979	6.4170113
35	5.614	31.52	24.756	.10	.5280	10501.35	1050.13	1738.9	3.0363	3458.5	1.4985862	6.5176330
36	5.000	25.00	19.635	.08	.4224	13238.89	1323.89	2192.5	2.4082	5497.4	1.3979400	6.6182992
37	4.453	19.83	15.667	.06	.3168	16901.01	1690.10	2765.5	1.9003	8742.1	1.2971087	6.7191357
38	3.965	15.72	12.241	.05	.2410	20854.63	2085.46	3486.7	1.5143	13772.	1.1944525	6.8167867
39	3.531	12.47	9.769	.04	.2113	25302.92	2530.29	4396.5	1.2012	21896.	1.0880665	6.9203727
40	3.144	9.80	7.7616	.03	.1584	33175.94	3317.59	5542.1	.957	34834.	0.9861963	7.0210429

This table has been prepared by George B. Prescott, Jr., by whose permission it is published.

## COMPARATIVE TABLE OF DIAMETER AND WEIGHT OF COPPER WIRE.

AMERICAN GAUGE.				BIRMINGHAM GAUGE.			
No. of Gauge.	Diameter in Mils.	Area in C M—d2	Pounds per 1,000 feet.	No. of Gauge.	Diameter in Mils.	Area in C M—d2	Pounds per 1,000 feet.
4-0	4600	211600	639.33	4-0	454	206116	623.925
3-0	4096	167805	507.01	3-0	425	180625	546.76
2-0	3648	133079	402.09	2-0	380	144400	437.107
				0	340	115600	349.928
0	3249	105592	319.04	1	300	90000	272.435
1	2893	83694	252.88	2	284	80656	244.15
2	2576	66373	200.54	3	259	67081	202.965
3	2294	52634	159.03	4	238	56644	171.465
				5	220	48400	146.51
4	2043	41742	126.12	6	203	41209	124.742
5	1819	33102	100.01	7	180	32400	98.076
6	162	26244	79.32	8	165	27225	82.41
7	1443	20822	62.90	9	148	21904	66.305
8	1285	16512	49.88	10	134	17956	54.354
9	1144	13110	39.56	11	120	14400	43.59
10	1019	10381	31.37	12	109	11881	35.964
11	0907	8226	24.88	13	095	9025	27.319
12	0808	6528	19.73	14	083	6889	20.853
13	072	5184	15.65	15	072	5184	15.692
14	0641	4110	12.41	16	065	4225	12.789
15	0571	3260	9.84	17	058	3364	10.18
16	0508	2581	7.81	18	049	2401	7.268
17	0452	2044	6.19	19	042	1764	5.340
18	0403	1624	4.91	20	035	1225	3.708
19	0359	1253	3.78	21	032	1024	3.099
20	032	1024	4.09	22	028	784	2.373
21	0285	820	2.45	23	025	625	1.892
22	0253	626	1.94	24	022	484	1.465
23	0226	510	1.54	25	020	400	1.211
24	0201	404	1.22	26	018	324	.9807
25	0179	320	.97	27	016	256	.7749
26	0159	254	.77	28	014	196	.5933
27	0142	201	.61	29	013	169	.5116
28	0126	159	.48	30	012	144	.4359
29	0113	127	.38	31	010	100	.3027
30	010	100	.20	32	009	81	.2452
31	0089	79	.24	33	008	64	.1937
32	0079	63	.19	34	007	49	.1483
33	007	49	.15				
34	006	36	.12				
35	0056	28	.10				
36	005	25	.08	35	005	25	.07568
37	0045	18	.06				
38	004	16	.05	36	004	16	.04843

## GALVANIZED IRON WIRE.

TABLE INDICATING SIZE, WEIGHT AND LENGTH BY WASHBURN & MOEN GAUGE.

W. & M. Wire Gauge. Numbers.	Diameter. Inches.	Weight of 100 feet. Lbs.	Weight of one mile. Lbs.	W. & M. Wire Gauge. Number.	Diameter. Inches.	Weight of 100 feet. Lbs.	Weight of one mile. Lbs.
3-0	.362	34.73	1834	18	.047	.58	31
2-0	.331	29.04	1533	19	.041	.45	24
1-0	.307	27.66	1460	20	.035	.32	17
1	.283	21.23	1121	21	.032	.27	14
2	.263	18.34	968	22	.028	.21	11
3	.244	15.78	833	23	.025	.175	9.24
4	.225	13.39	707	24	.023	.140	7.39
5	.207	11.35	599	25	.020	.116	6.124
6	.192	9.73	514	26	.018	.093	4.91
7	.177	8.03	439	27	.017	.083	4.382
8	.162	6.96	367	28	.016	.074	3.907
9	.148	5.08	306	29	.015	.061	3.22
10	.135	4.83	255	30	.014	.054	2.851
11	.120	3.82	202	31	.0135	.050	2.64
12	.105	2.92	154	32	.013	.046	2.428
13	.092	2.24	118	33	.011	.037	1.953
14	.080	1.69	89	34	.010	.030	1.584
15	.072	1.37	72	35	.0095	.025	1.32
16	.063	1.05	55	36	.009	.021	1.161
17	.054	.77	41				

## PLATINUM WIRE.

One foot of No. 12			Approximate.	Weights 310.7 grains	
"	"	" 14	"	195.4	"
"	"	" 16	"	122.8	"
"	"	" 18	"	77.3	"
"	"	" 20	"	48.6	"
"	"	" 22	"	30.6	"
"	"	" 24	"	19.2	"
"	"	" 26	"	12.1	"
"	"	" 28	"	7.60	"
"	"	" 30	"	4.79	"
"	"	" 32	"	3.01	"
"	"	" 34	"	1.89	"
"	"	" 36	"	1.19	"

# Weights of Iron, Steel, Copper and Brass Wire.

DIAMETERS DETERMINED BY AMERICAN GAUGE.

No. of Gauge.	Size of each No.	WEIGHT OF WIRE PER 1000 LINEAL FEET.			
		Wrought Iron.	Steel.	Copper.	Brass.
	INCH.	LBS.	LBS.	LBS.	LBS.
0000	.46000	560.74	566.03	640.51	605.18
000	.40964	444.68	448.88	507.95	479.91
00	.36430	352.66	355.99	402.83	380.67
0	.32486	279.67	282.30	319.45	301.82
1	.28930	221.79	223.89	253.34	239.35
2	.25768	175.89	177.55	200.91	189.82
3	.22942	139.48	140.80	159.32	150.52
4	.20431	110.62	111.66	126.35	119.38
5	.18194	87.720	88.548	100.20	94.666
6	.16202	69.565	70.221	79.462	75.075
7	.14428	55.165	55.685	63.013	59.545
8	.12849	43.751	44.164	49.976	47.219
9	.11443	34.699	35.026	39.636	37.437
10	.10189	27.512	27.772	31.426	29.687
11	.090742	21.820	22.026	24.924	23.549
12	.080808	17.304	17.468	19.766	18.676
13	.071961	13.722	13.851	15.674	14.809
14	.064084	10.886	10.989	12.435	11.746
15	.057068	8.631	8.712	9.859	9.315
16	.050820	6.845	6.909	7.819	7.587
17	.045257	5.427	5.478	6.199	5.857
18	.040303	4.304	4.344	4.916	4.645
19	.035890	3.413	3.445	3.899	3.684
20	.031961	2.708	2.734	3.094	2.920
21	.028462	2.147	2.167	2.452	2.317
22	.025347	1.703	1.719	1.945	1.838
23	.022571	1.350	1.363	1.542	1.457
24	.020100	1.071	1.081	1.223	1.155
25	.017900	0.8491	0.8571	.9699	0.9163
26	.015940	0.6734	0.6797	.7692	0.7267
27	.014195	0.5340	0.5391	.6099	0.5763
28	.012641	0.4235	0.4275	.4837	0.4570
29	.011257	0.3358	0.3389	.3835	0.3624
30	.010025	0.2663	0.2688	.3042	0.2874
31	.008928	0.2113	0.2132	.2413	0.2280
32	.007950	0.1675	0.1691	.1913	0.1808
33	.007080	0.1328	0.1341	.1517	0.1434
34	.006304	0.1053	0.1063	.1204	0.1137
35	.005614	.08366	.08445	.0956	0.0915
36	.005000	.06625	.06687	.0757	.0715
37	.004453	.05255	.05304	.06003	.05671
38	.003965	.04166	.04205	.04758	.04496
39	.003531	.03305	.03336	.03755	.03566
40	.003144	.02620	.02644	.02992	.02827
Specific Grav.....		7.7747	7.847	8.880	4.16
W'ght per Cubic Ft.		485.874	490.45	554.988	528.386

## IRON PIPE SIZES.

Actual Outside Dia. Inches.	No. of Threads per Inch.	TRADE NAME	Nominal Thickness. Inches.	Weight per Running Foot.
0.405	27	$\frac{1}{8}$	.063	0.24
0.54	18	$\frac{1}{4}$	.088	0.42
0.675	18	$\frac{3}{8}$	.091	0.56
0.84	14	$\frac{1}{2}$	.109	0.84
1.05	14	$\frac{3}{4}$	.113	1.12
1.315	$11\frac{1}{2}$	1	.134	1.67
1.66	$11\frac{1}{2}$	$1\frac{1}{4}$	.140	2.25
1.9	$11\frac{1}{2}$	$1\frac{1}{2}$	.145	2.69
2.375	$11\frac{1}{2}$	2	.154	3.66
ACTUAL SIZES.				

Copyrighted by E. F. GENNERT, 1888.

The above represents a center sectional view of iron pipe from  $\frac{1}{8}$  to 2 inches, each piece being  $\frac{1}{2}$  inch long, showing actual diameter of pipe, size of threads, etc.

To those not versed in Iron Pipe Sizes—and even gas-fitters are puzzled sometimes—this chart will come in handy when any doubt exists regarding drops in ceilings or walls, or when size of fittings is questioned; and if consulted there will be no excuse for any one to order fittings for “ $\frac{1}{2}$ -inch iron pipe” when they really want  $\frac{1}{2}$ -inch iron pipe, etc.

# DECIMAL EQUIVALENTS AND THE METRIC SYSTEM.

## TABLE OF DECIMAL EQUIVALENTS OF 8ths, 16ths, 32ds and 64ths of an Inch. FOR USE IN CONNECTION WITH THE MICROMETER CALIPER.

8ths.		
$\frac{1}{8}$ = .125	$\frac{9}{8}$ = .28125	$\frac{17}{8}$ = .296875
$\frac{2}{8}$ = .250	$\frac{10}{8}$ = .34375	$\frac{18}{8}$ = .328125
$\frac{3}{8}$ = .375	$\frac{11}{8}$ = .40625	$\frac{19}{8}$ = .359375
$\frac{4}{8}$ = .500	$\frac{12}{8}$ = .46875	$\frac{20}{8}$ = .390625
$\frac{5}{8}$ = .625	$\frac{13}{8}$ = .53125	$\frac{21}{8}$ = .421875
$\frac{6}{8}$ = .750	$\frac{14}{8}$ = .59375	$\frac{22}{8}$ = .453125
$\frac{7}{8}$ = .875	$\frac{15}{8}$ = .65625	$\frac{23}{8}$ = .484375
	$\frac{16}{8}$ = .71875	$\frac{24}{8}$ = .515625
16ths.	$\frac{17}{8}$ = .78125	$\frac{25}{8}$ = .546875
$\frac{1}{16}$ = .0625	$\frac{18}{8}$ = .84375	$\frac{26}{8}$ = .578125
$\frac{2}{16}$ = .125	$\frac{19}{8}$ = .90625	$\frac{27}{8}$ = .609375
$\frac{3}{16}$ = .1875	$\frac{20}{8}$ = .96875	$\frac{28}{8}$ = .640625
$\frac{4}{16}$ = .250		$\frac{29}{8}$ = .671875
$\frac{5}{16}$ = .3125	64ths.	$\frac{30}{8}$ = .703125
$\frac{6}{16}$ = .375	$\frac{1}{64}$ = .015625	$\frac{31}{8}$ = .734375
$\frac{7}{16}$ = .4375	$\frac{2}{64}$ = .046875	$\frac{32}{8}$ = .765625
$\frac{8}{16}$ = .500	$\frac{3}{64}$ = .078125	$\frac{33}{8}$ = .796875
$\frac{9}{16}$ = .5625	$\frac{4}{64}$ = .109375	$\frac{34}{8}$ = .828125
$\frac{10}{16}$ = .625	$\frac{5}{64}$ = .140625	$\frac{35}{8}$ = .859375
$\frac{11}{16}$ = .6875	$\frac{6}{64}$ = .171875	$\frac{36}{8}$ = .890625
$\frac{12}{16}$ = .750	$\frac{7}{64}$ = .203125	$\frac{37}{8}$ = .921875
$\frac{13}{16}$ = .8125	$\frac{8}{64}$ = .234375	$\frac{38}{8}$ = .953125
$\frac{14}{16}$ = .875	$\frac{9}{64}$ = .265625	$\frac{39}{8}$ = .984375
$\frac{15}{16}$ = .9375		
	32ds.	
$\frac{1}{32}$ = .03125		
$\frac{2}{32}$ = .0625		
$\frac{3}{32}$ = .09375		
$\frac{4}{32}$ = .125		
$\frac{5}{32}$ = .15625		
$\frac{6}{32}$ = .1875		

## THE METRIC SYSTEM.

### WEIGHTS.

Metric Denominations and Values.	No. Grams.	Weight of white quantity of water at maximum density.	Apothecaries Weight.
Millier or tonneau	= 1,000,000	= 1 cubic meter	= 2904.6 pounds
Quintal	= 100,000	= 1 hectoliter	= 290.46 pounds
Myriagram	= 10,000	= 10 liters	= 29.046 pounds
Kilogram or Kil-	= 1,000	= 1 liter	= 2.9046 pounds
Hectogram	= 100	= 1 deciliter	= 0.36274 ounces.
Dekagram	= 10	= 10 c. centimet.	= 3.6274 ounces.
Gram	= 1	= 1 c. centimet.	= 15.432 grains.
Decigram	= .1	= 1 c. centimet.	= 1.5432 grains.
Centigram	= .01	= 10 c. millimet.	= 0.1543 grain.
Milligram	= .001	= 1 c. millimet.	= 0.0154 grain.

### MEASURES OF LENGTH.

Metric Denominations and Values.	Equivalents in Denominations in use.
Myriameter	= 10,000 meters = 0.2137 miles.
Kilometer	= 1,000 meters = 0.62137 m. or 3,280 ft. 10 in.
Hectometer	= 100 meters = 328 feet and 1 inch.
Dekameter	= 10 meters = 39.37 inches.
Meter	= 1 meter = 39.37 inches.
Decimeter	= .1 of a meter = 3.937 inches.
Centimeter	= .01 of a meter = 0.3937 inch.
Millimeter	= .001 of a meter = 0.0394 inch.

### MEASURES OF SURFACE.

Metric Denominations and Values.	Equivalents in Denominations in use.
Hectare	= 10,000 square meters = 2.471 acres.
Are	= 100 square meters = 110.0 square yards.
Centare	= 1 square meter = 1.550 square inches.

### MEASURES OF CAPACITY.

Metric Denominations and Values.	No. Liters.	Cubic Measure.	Wine Measure.
Kiloliter	= 1,000	= 1 cubic meter	= 1.358 cubic yards = 264.17 galls.
Hectoliter	= 100	= .1 cubic meter	= 2 bush. 2.36 pbs. = 26.417 galls.
Decaliter	= 10	= 10 c. decimeters	= 9.08 quarts = 2.0417 galls.
Liter	= 1	= 1 c. decimeter	= 0.008 quart = 1.0567 qts.
Deciliter	= .1	= 1 c. decimeter	= 0.1022 cubic in. = 0.0016 gill.
Centiliter	= .01	= 10 c. centimeters	= 0.0102 cubic in. = 0.368 fluid dr.
Milliliter	= .001	= 1 c. centimeter	= 0.001 cubic inch = 0.37 fluid dr.

## SIMPLIFIED COPPER WIRE EQUATIONS.

By Charles Wirt.

The following formulæ are for commercial copper of 97 per cent. conductivity at 75 degrees Fahrenheit. They are correct within a fraction of one per cent., and are shorter than the usual form of these equations.

(M)=Circular Mils.

"/=Circular Inches.

R=Resistance in Ohms.

W=Weight in Pounds.

L=Length in Feet.

$$R = \frac{11L}{(M)}$$

$$R = \frac{L^2}{30000W}$$

$$W = \frac{L^2}{30000R}$$

$$W = "/>x3.03L$$

$$W = \frac{(M)x3.03L}{1000000}$$

$$L = \frac{(M)R}{11}$$

$$L = \sqrt{WR30000}$$

$$"/ = \frac{W}{3.03L}$$

$$(M) = \frac{11L}{R}$$

$$(M) = \frac{1000000W}{3.03L}$$

## AMOUNT OF DROP IN WIRES WITH A GIVEN CURRENT.

American Gauge, Brown & Sharpe's No.	CIRCULAR MILS. (d <sup>2</sup> .)	Fall of Potential in Volts, per Ampere per 1,000 ft.	American Gauge, Brown & Sharpe's No.	CIRCULAR MILS. (d <sup>2</sup> .)	Fall of Potential in Volts, per Ampere per 1,000 ft.
0000	211600.00	.0505318	9	13094.00	.8165943
000	167805.00	.0637158	10	10381.00	1.03
00	133079.40	.0803503	11	8234.00	1.298521
0	105592.50	.1012593	12	6529.90	1.637494
1	83694.20	.1277612	13	5178.40	2.064841
2	66373.00	.1610920	14	4106.80	2.668524
3	52634.00	.2031469	15	3256.70	3.208450
4	41742.00	.2561507	16	2582.90	4.139673
5	33102.00	.3230183	17	2048.20	5.220349
6	26250.50	.4073238	18	1624.30	6.582833
7	20816.00	.5136713	19	1252.40	8.537567
8	16509.00	.6476743	20	1021.50	10.46789

## TABLES OF LIMITING CURRENTS.

Taken from Mr. A. E. Kennelly's Report on "Heating of Conductors by Electric Currents," read before the Edison Convention, August, 1889.

TABLE 1—Applies to insulated copper house wires of 98 per cent. conductivity, carrying continuous currents, and encased in wooden moulding. The rule followed is that the temperature elevation of any wire shall not, with the proposed current, exceed 18° F. or 10° C.

Amperes.	Number in B. & S.	Diameter in Inches.	Circular Mils.	Amperes.	Number in B. & S.	Diameter in Inches.	Circular Mils.
1,000		1.47	2160900	61	3	.2294	52634
900		1.37	1876900	52	4	.2043	41742
800		1.27	1612900	43	5	.1819	33102
700		1.16	1345600	36	6	.1620	26244
600		1.049	1100401	30	7	.1442	20822
550		.988	976144	25	8	.1284	16512
500		.928	861184	22	9	.1144	13110
475		.897	804609	18	10	.1019	10381
450		.865	748225	15	11	.0907	8226
425		.832	692224	12	12	.0808	6528
400		.800	640000	10.5	13	.0719	5184
375		.766	586756	9.0	14	.0641	4110
350		.732	535824	7.25	15	.0571	3260
325		.697	485809	6.00	16	.0508	2581
300		.660	435600	5.50	17	.0452	2044
275		.623	388129	4.00	18	.0403	1624
250		.585	342225	3.25	19	.0359	1253
225		.545	297025	2.75	20	.0319	1024
200		.504	254016	2.25	21	.0285	820
174	0000	.460	211600	2.00	22	.0253	626
147	000	.4096	167805	1.75	23	.0226	510
124	00	.3648	133079	1.50	24	.0201	404
103	0	.3249	105592	1.25	25	.0179	320
87	1	.2893	83694	1.00	26	.0159	254
73	2	.2576	66373				

# **WIRING TABLE FOR 50 VOLT, 16 CANDLE POWER LAMPS,** **Loss of 1 Volt.**

No. of Lamps.	Distance in Feet to Center of Distribution.																	Wire Sizes are indicated below in B. & S. Gauge.		
	20'	25'	30'	35'	40'	45'	50'	60'	70'	80'	90'	100'	120'	140'	160'	180'	200'			
1	16	16	16	16	16	16	16	16	16	16	16	16	16	15	14	14	13			
2	16	16	16	16	16	16	16	16	15	15	14	13	13	12	12	11	10			
3	16	16	16	16	16	15	15	14	13	13	12	12	11	10	10	9	9			
4	16	16	16	15	15	14	13	13	12	11	11	10	10	9	8	8	7			
5	16	16	15	14	13	13	12	12	11	11	10	10	9	8	8	7	7			
6	16	15	14	13	13	12	12	11	11	10	10	9	8	8	7	7	6			
7	15	14	13	13	12	12	11	11	10	9	9	8	8	7	6	6	5			
8	15	14	13	12	12	11	11	10	9	9	8	8	7	6	6	5	5			
9	14	13	12	12	11	11	10	9	9	8	8	7	6	6	5	5	4			
10	14	13	12	11	11	10	10	9	8	8	7	7	6	5	5	4	4			
12	13	12	11	11	10	10	9	8	8	7	7	6	5	5	4	4	3			
14	12	11	10	10	9	9	8	7	7	6	6	5	4	4	3	3	2			
16	12	11	10	9	9	8	8	7	6	6	5	5	4	3	3	2	2			
18	11	10	9	8	8	7	7	6	6	5	5	4	3	3	2	2	1			
20	11	10	9	8	8	7	7	6	5	5	4	4	3	2	2	1	1			
25	10	9	8	7	7	6	6	5	4	4	3	3	2	1	1	0	0			
30	9	8	7	7	6	5	5	4	3	3	2	2	1	0	0	0	00			
35	8	7	7	6	5	5	4	4	3	2	2	1	1	0	00	00	000			
40	8	7	6	5	5	4	4	3	2	2	1	1	0	00	000	000	000			
45	7	6	5	5	4	4	3	2	2	1	1	0	00	00	000	000	0000			
50	6	6	5	4	4	3	3	2	1	1	0	0	00	000	000	0000	0000			
55	6	5	5	4	3	3	2	2	1	0	0	00	00	000	0000	0000	0000			
60	5	5	4	4	3	3	2	1	0	0	00	00	000	000	0000	....	....			
65	5	5	4	3	3	2	2	1	0	0	00	00	000	0000	0000	....	....			
70	4	4	4	3	2	2	1	1	0	00	00	000	000	0000	0000	....	....			
75	4	4	3	3	2	1	1	0	00	00	000	000	0000	0000	....	....	....			
80	3	3	3	2	2	1	1	0	00	00	000	000	0000	0000	....	....	....			
90	3	3	2	2	1	1	0	00	00	000	000	0000	0000	....	....	....	....			
100	2	2	2	1	1	0	0	00	000	000	0000	0000	....	....	....	....	....			

# WIRING TABLE FOR 110 VOLT, 16 CANDLE POWER LAMPS,

Loss of  $2\frac{1}{2}$  Volts.

No. of Lamps.	Distance in Feet to Center of Distribution.																Wire Sizes are indicated below in B. & S. Gauge.			
	20'	25'	30'	35'	40'	45'	50'	60'	70'	80'	90'	100'	120'	140'	160'	180'	200'			
1	19	19	19	19	19	19	19	19	19	19	19	19	19	18	17	17	16			
2	19	19	19	19	19	19	19	19	18	18	17	16	16	15	15	14	13			
3	19	19	19	19	19	18	18	17	16	16	15	15	14	13	13	12	12			
4	19	19	19	18	18	17	16	16	15	14	14	13	13	12	11	11	10			
5	19	19	18	17	16	16	16	15	14	14	13	13	12	11	11	10	10			
6	19	18	17	16	16	15	15	14	14	13	13	12	11	11	10	10	9			
7	18	17	16	16	15	15	14	14	13	12	12	11	11	10	9	9	8			
8	18	17	16	15	15	14	14	13	12	12	11	11	10	9	9	8	8			
9	17	16	15	15	14	14	13	12	12	11	11	10	9	9	8	8	7			
10	17	16	15	14	14	13	13	12	11	11	10	10	9	8	8	7	7			
12	16	15	14	14	13	13	12	11	11	10	10	9	8	8	7	7	6			
14	15	14	13	13	12	12	11	10	10	9	9	8	7	7	6	6	5			
16	15	14	13	12	12	11	11	10	9	9	8	8	7	6	6	5	5			
18	14	13	12	11	11	10	10	9	9	8	8	7	6	6	5	5	4			
20	14	13	12	11	11	10	10	9	8	8	7	7	6	5	5	4	4			
25	13	12	11	10	10	9	9	8	7	7	6	6	5	4	4	3	3			
30	12	11	10	10	9	8	8	7	6	6	5	5	4	3	3	3	2			
35	11	10	10	9	8	8	7	7	6	5	5	4	4	3	2	2	1			
40	11	10	9	8	8	7	7	6	5	5	4	4	3	2	1	1	1			
45	10	9	8	8	7	7	6	5	5	4	4	3	2	2	1	1	0			
50	9	9	8	7	7	6	6	5	4	4	3	3	2	1	1	0	0			
55	9	8	8	7	6	6	5	5	4	3	3	2	2	1	0	0	0			
60	8	8	7	7	6	6	5	4	3	3	2	2	1	1	0	....	....			
65	8	8	7	6	6	5	5	4	3	3	2	2	1	0	0	....	....			
70	7	7	7	6	5	5	4	4	3	2	2	1	1	0	0	....	....			
75	7	7	6	6	5	4	4	3	2	2	1	1	0	0	....	....	....			
80	6	6	6	5	5	4	4	3	2	2	1	1	0	0	....	....	....			
90	6	6	5	5	4	4	3	2	2	1	1	0	0	....	....	....	....			
100	5	5	5	4	4	3	3	2	1	1	0	0	....	....	....	....	....			

## TABLE SHOWING HORSE-POWER

Required to Transmit the Following Currents over One Mile of Copper Wire,  
and the Equivalent in Arc Lamps per Mile.

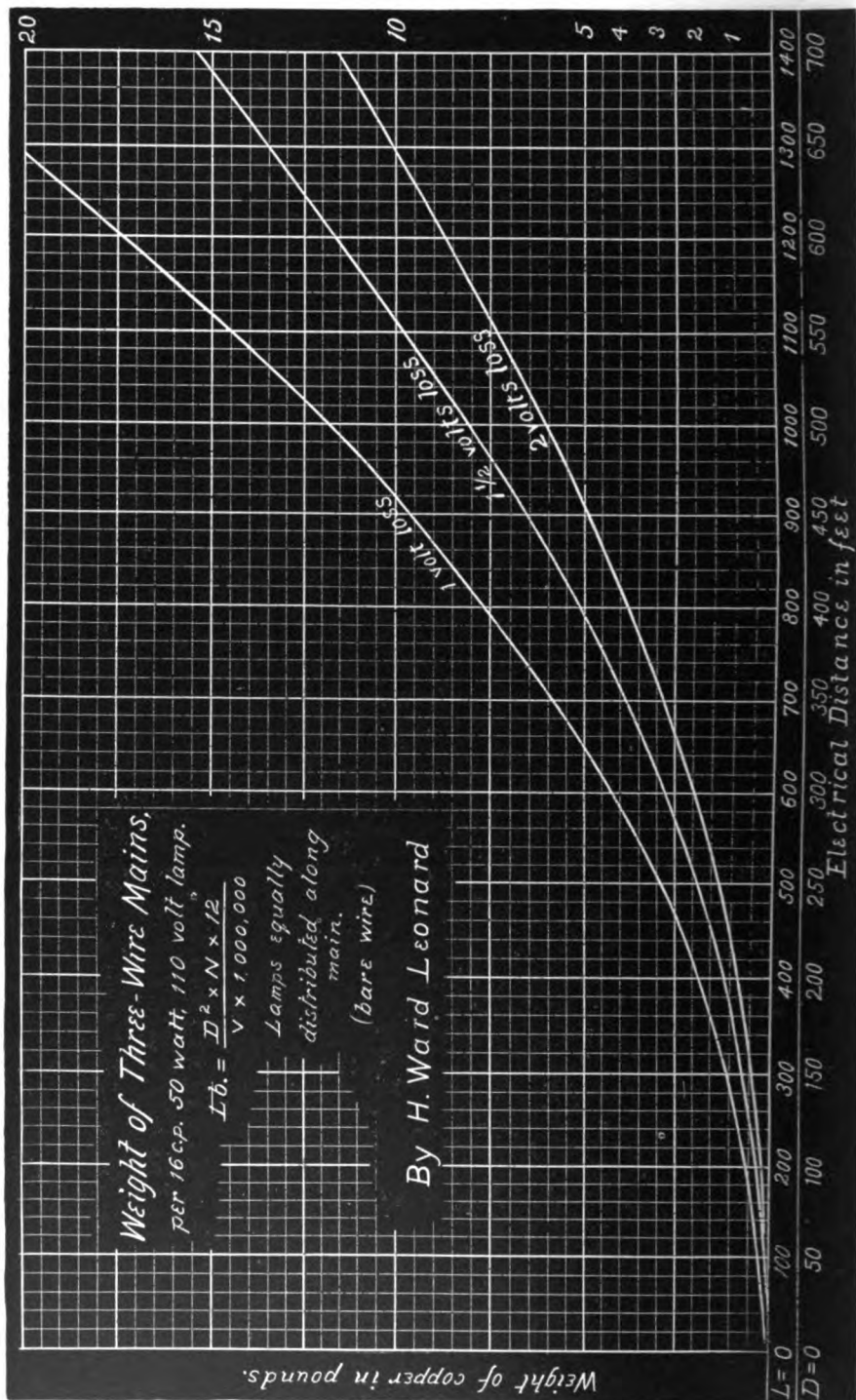
By F. E. Smith, July 20, 1888.

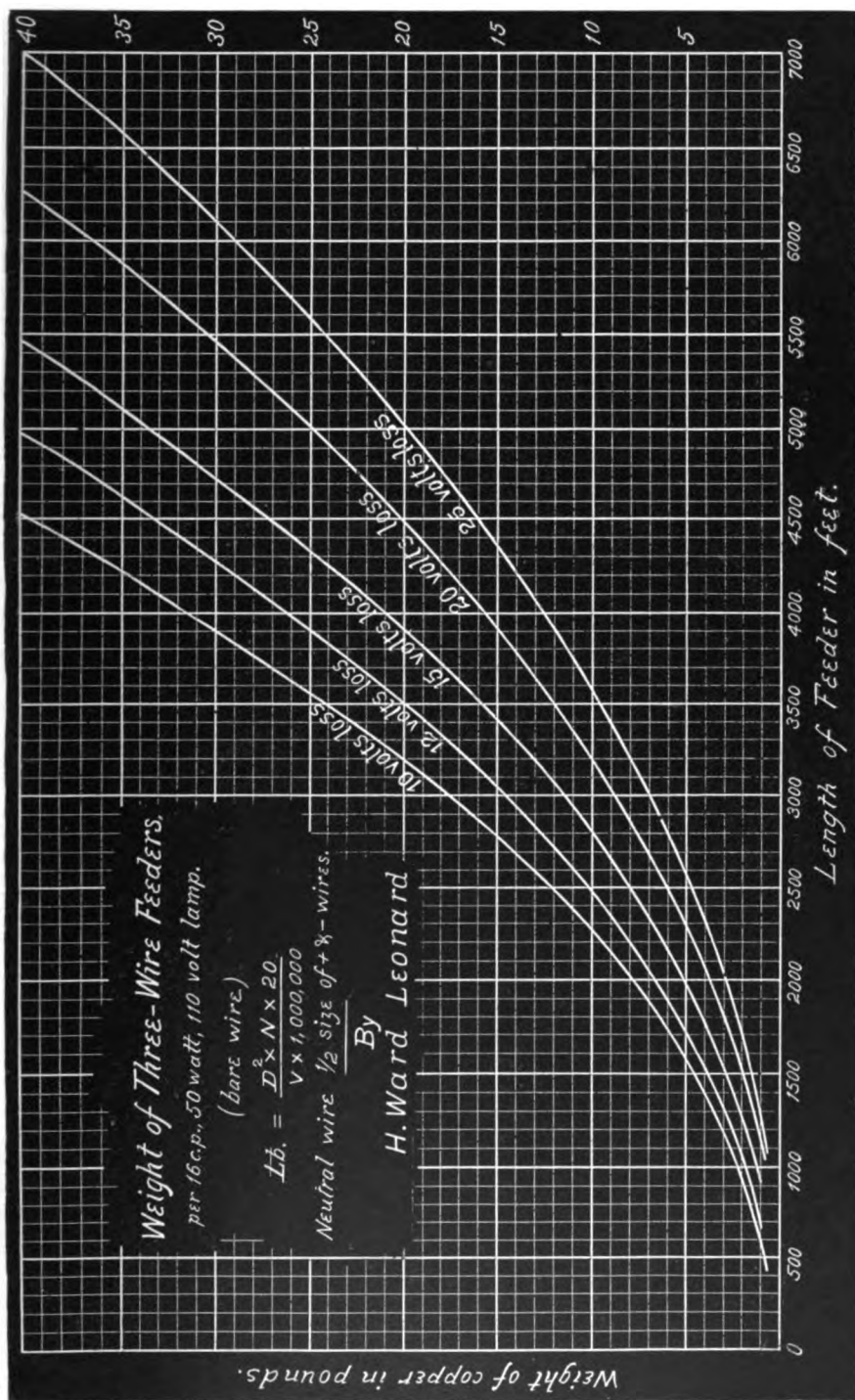
B. & S. Wire Gauge.	6½ AMPERES.		10 AMPERES.		15 AMPERES.		20 AMPERES.	
	H. P.	Lamps.	H. P.	Lamps.	H. P.	Lamps.	H. P.	Lamps.
0000	.013	.03	.033	.05	.078	.08	.138	.11
000	.018	.04	.043	.07	.098	.10	.175	.14
00	.023	.05	.055	.09	.123	.13	.220	.18
0	.029	.07	.069	.11	.156	.17	.278	.23
1	.037	.09	.087	.12	.197	.21	.351	.29
2	.046	.11	.110	.18	.248	.23	.442	.36
3	.058	.14	.139	.23	.318	.34	.558	.46
4	.074	.18	.176	.29	.396	.43	.704	.58
5	.093	.23	.222	.36	.499	.55	.887	.73
6	.116	.29	.279	.46	.629	.69	1.119	.92
7	.144	.37	.352	.58	.794	.87	1.411	1.12
8	.188	.47	.445	.73	1.001	1.16	1.780	1.47
9	.237	.59	.561	.93	1.261	1.39	2.244	1.86
10	.299	.75	.707	1.15	1.592	1.76	2.831	2.34
12	.475	1.05	1.125	1.84	2.531	2.79	4.500	3.73
14	.774	1.95	4.903	3.04	4.126	4.56		

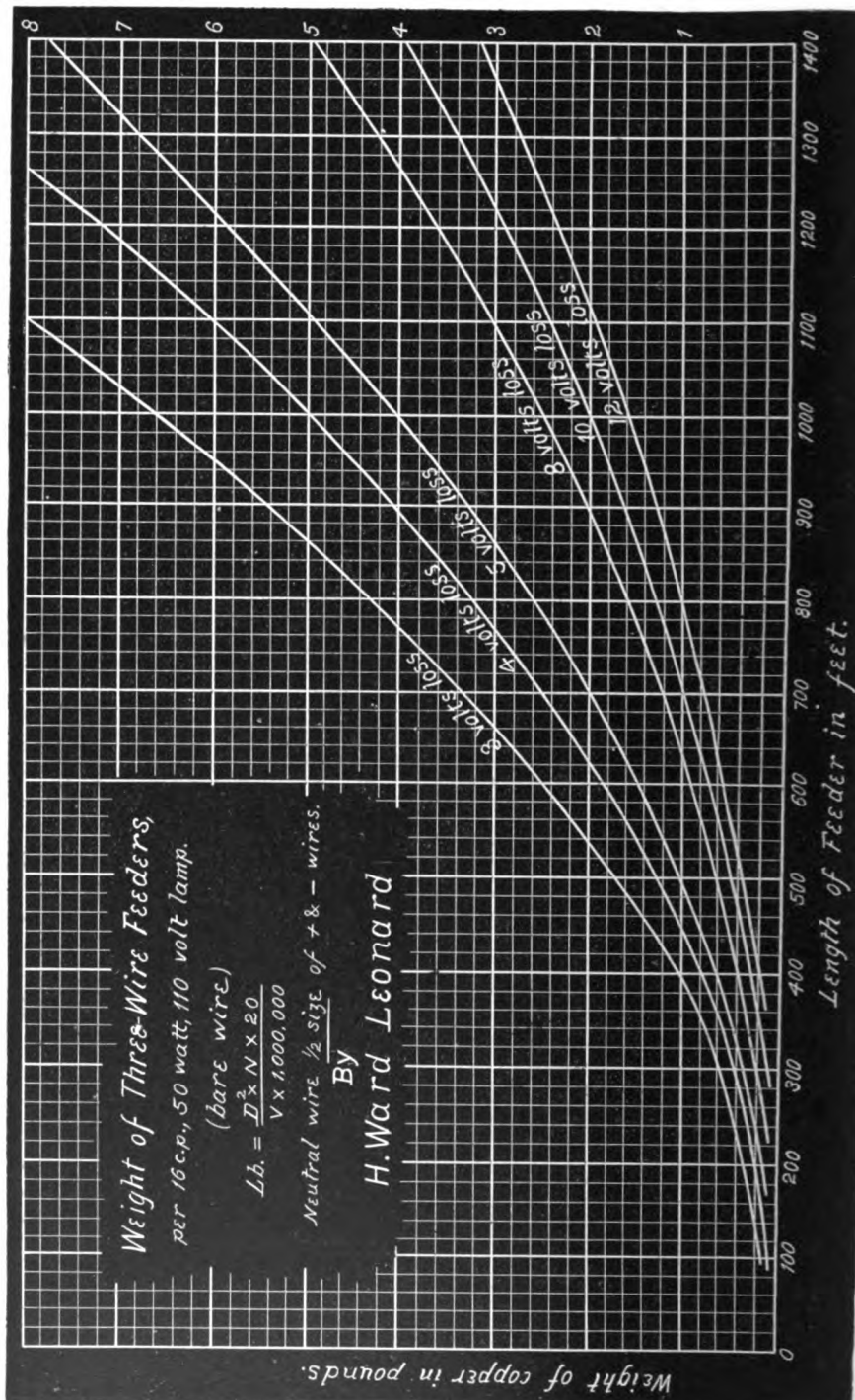
## EQUIVALENTS OF WIRES.

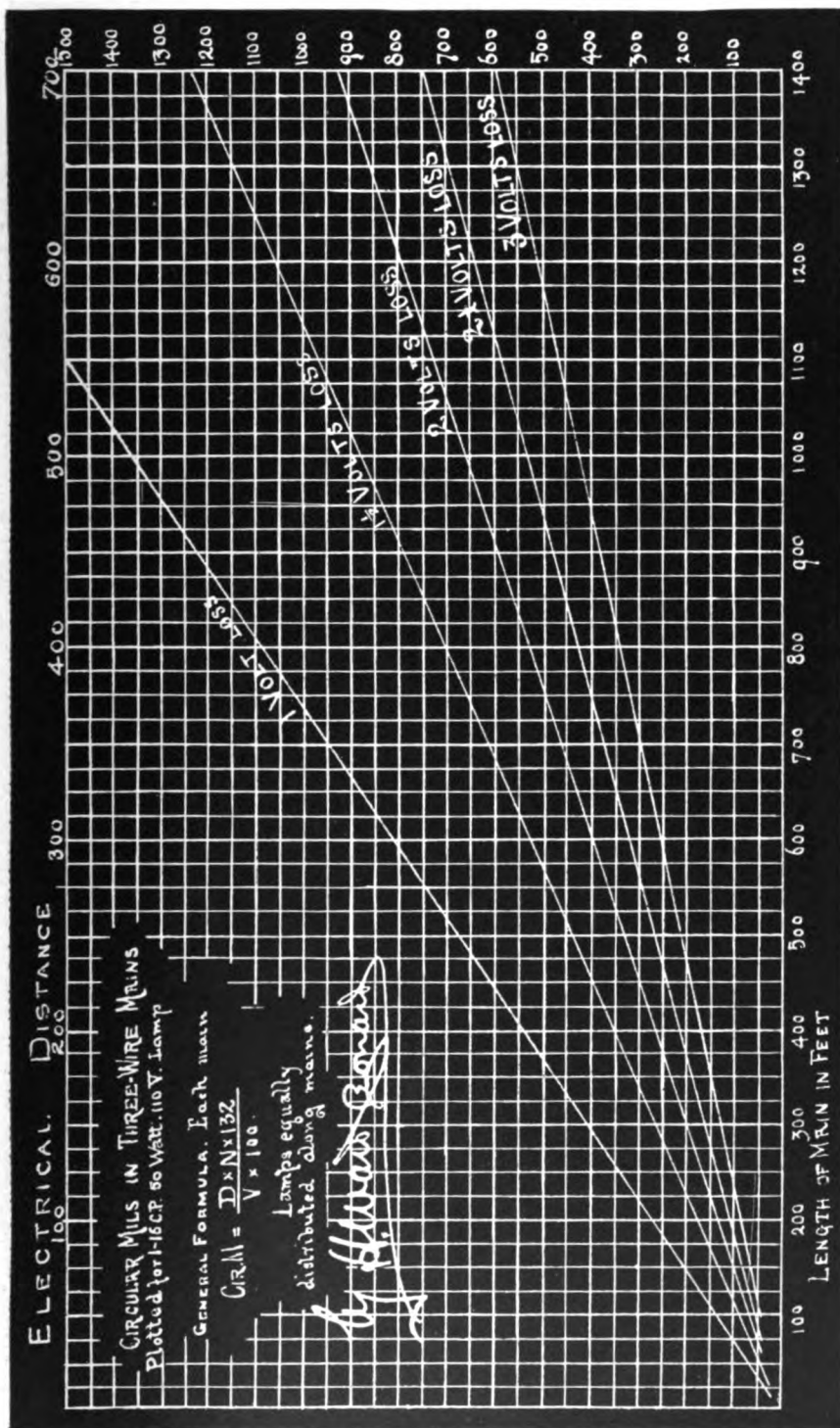
Brown & Sharpe Gauge.

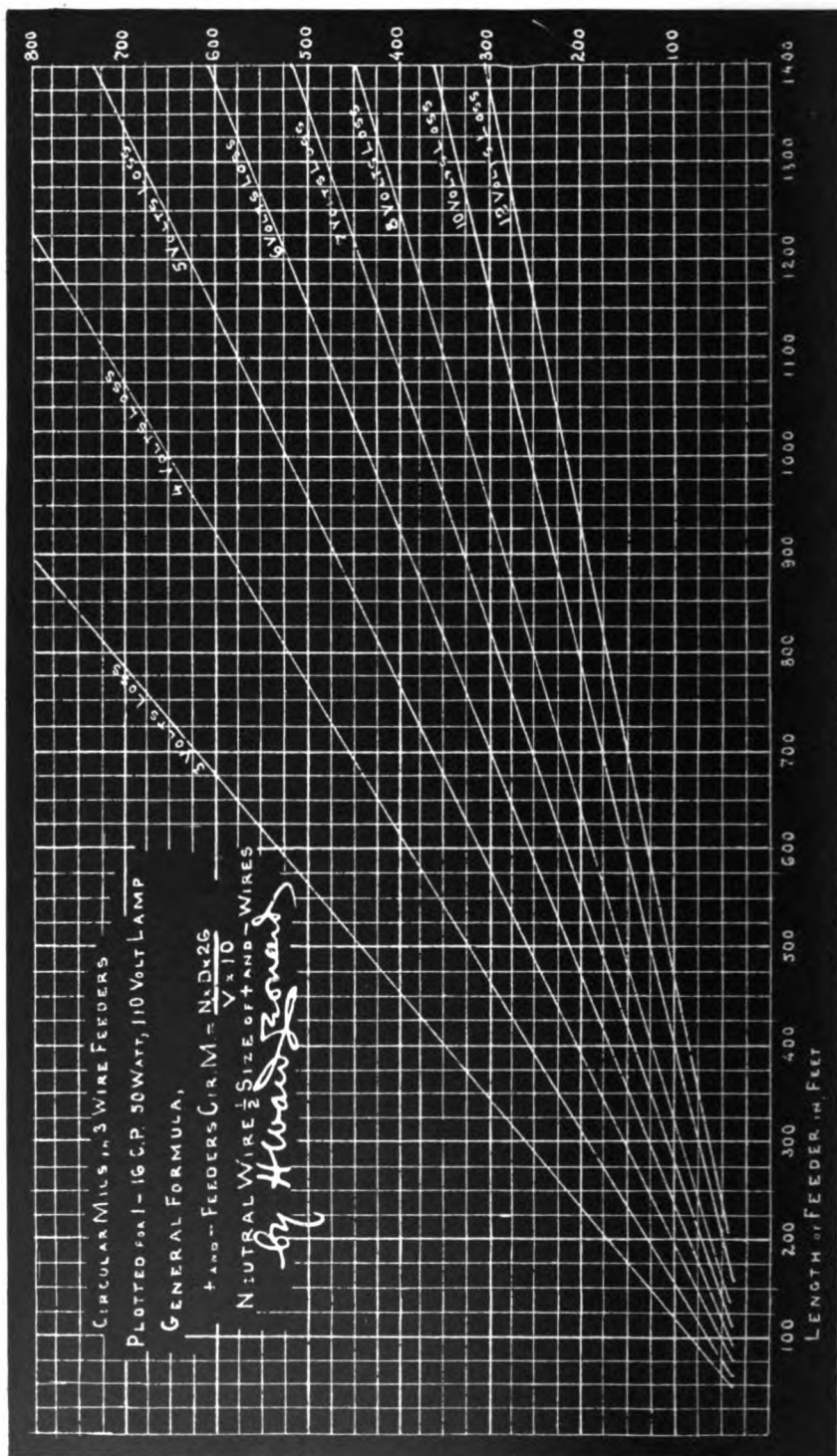
0000	2 No. 0	4 No. 3	8 No. 6	16 No. 9	32 No. 12	64 No. 15
000	2 " 1	4 " 4	8 " 7	16 " 10	32 " 13	64 " 16
00	2 " 2	4 " 5	8 " 8	16 " 11	32 " 14	64 " 17
0	2 " 3	4 " 6	8 " 9	16 " 12	32 " 15	64 " 18
1	2 " 4	4 " 7	8 " 10	16 " 13	32 " 16	64 " 19
2	2 " 5	4 " 8	8 " 11	16 " 14	32 " 17	64 " 20
3	2 " 6	4 " 9	8 " 12	16 " 15	32 " 18	64 " 21
4	2 " 7	4 " 10	8 " 13	16 " 16	32 " 19	64 " 22
5	2 " 8	4 " 11	8 " 14	16 " 17	32 " 20	64 " 23
6	2 " 9	4 " 12	8 " 15	16 " 18	32 " 21	64 " 24
7	2 " 10	4 " 13	8 " 16	16 " 19	32 " 22	64 " 25
8	2 " 11	4 " 14	8 " 17	16 " 20	32 " 23	64 " 26
9	2 " 12	4 " 15	8 " 18	16 " 21	32 " 24	64 " 27
10	2 " 13	4 " 16	8 " 19	16 " 22	32 " 25	64 " 28
11	2 " 14	4 " 17	8 " 20	16 " 23	32 " 26	64 " 29
12	2 " 15	4 " 18	8 " 21	16 " 24	32 " 27	64 " 30
13	2 " 16	4 " 19	8 " 22	16 " 25	32 " 28	
14	2 " 17	4 " 20	8 " 23	16 " 26	32 " 29	
15	2 " 18	4 " 21	8 " 24	16 " 27	32 " 30	
16	2 " 19	4 " 22	8 " 25	16 " 28		
17	2 " 20	4 " 23	8 " 26	16 " 29		
18	2 " 21	4 " 24	8 " 27	16 " 30		
19	2 " 22	4 " 25	8 " 28			
20	2 " 23	4 " 26	8 " 29			
21	2 " 24	4 " 27	8 " 30			

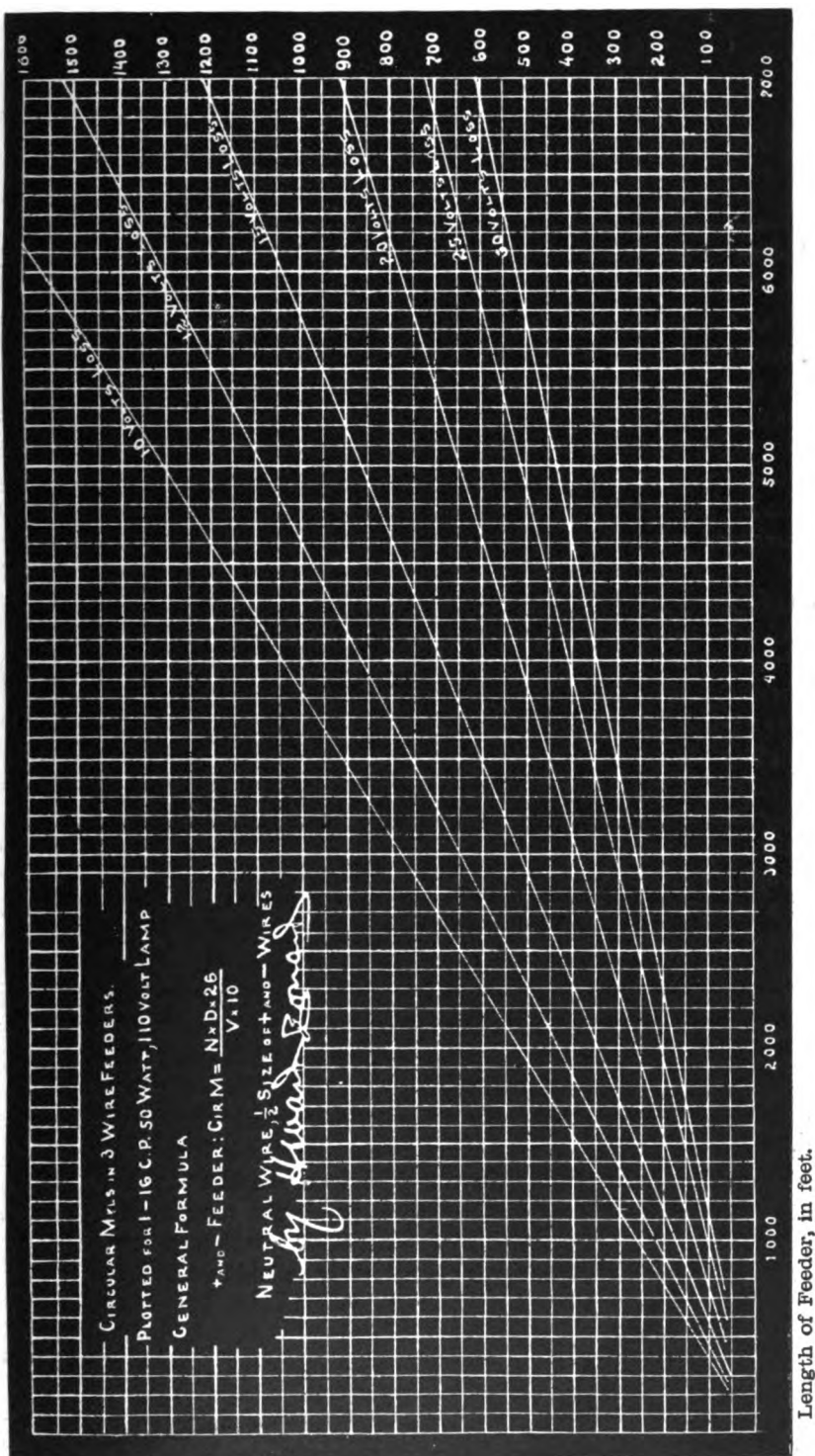












## WIRING TABLES.

**Taken, by permission of the Author, from Carl Hering's "Wiring Computer."**

The following set of five tables will be found very convenient for a special and limited class of work. They give the distances in feet up to 1,000, to which each size of wire of the B. & S. gauge will carry any given number of lamps at stated losses. Usually such tables are arranged differently, the sizes of wire being given for each number of lamp at regularly increasing distances. By the present arrangement, however, a table of the same size will cover a very much greater range of values; and, as it gives actual values instead of approximate ones, it is even more accurate, notwithstanding its increased range. It is also more convenient to use, because instead of following two rows of figures to their intersection one line of figures is followed around a corner, which for rapid work and a condensed table, is less confusing.

Such tables are necessarily limited to special lamps and losses. The values assumed in the following set have been chosen so as to cover as wide a range as possible, and to suit the usual lamps, voltages, and losses. For lamps of slightly different currents than those assumed, it need be remembered merely, that if the current is slightly greater, the distances must be taken slightly less than those given, and vice versa. For half the losses given, take half the distances, or better, take the distances for double the number of lamps. Although calculated for five special cases, these tables may be used also for quite a number of other lamps, voltages, and losses. These have all been classified in the index on the opposite page to facilitate finding which table to use.

It should be distinctly understood that these tables are not to be used for successive parts of branched circuits, unless the loss is understood to be for that part only. For instance, suppose the loss in a building is two per cent., and a certain circuit branches into two, say at one-fourth of the distance to the lamps, it is not correct to find the size of the first part for a two per cent. loss, and then the sizes of the second parts for a two per cent. loss, as this would give a total loss of four per cent. But if the loss on the first part be taken as, say one-half per cent., and that on the second parts, the remaining one and one-half per cent., then the tables may be used for each part separately. This error has been made frequently by presumably reliable wiremen.

## WIRING TABLES

*Continued.*

## INDEX TO WIRING TABLES.

## TWO WIRE SYSTEM.

For a 50 volt lamp, taking 1.1 amperes.	Loss 2.2 % or 1.1 volts, use table No. 1.
50 " " 1.1 " "	4.4 " " " 2
50 " " 1. " "	9.6 " " " 3
50 " " 1. " "	2. " " " 1
50 " " 1. " "	4. " " " 2
50 " " 1. " "	8.8 " " " 3
For a 55 volt lamp, taking 1.1 amperes.	Loss 2.2 % or 1.1 volts, use table No. 1.
55 " " 1.1 " "	4. " " " 2
55 " " 1.1 " "	8.8 " " " 3
55 " " 1. " "	1.8 " " " 1
55 " " 1. " "	3.6 " " " 2
55 " " 1. " "	8. " " " 3
For a 75 volt lamp, taking .75 amperes.	Loss 1. % or .75 volts, use table No. 1.
75 " " .75 " "	1.5 " " " 2
75 " " .75 " "	4.4 " " " 3
75 " " .75 " "	8.8 " " " 4
For a 75 volt lamp, taking .6 amperes.	Loss .8 % or .6 volts, use table No. 1.
75 " " .6 " "	1.6 " " " 2
75 " " .6 " "	3.6 " " " 3
75 " " .6 " "	7. " " (approx.) " 4
For a 100 volt lamp, taking .5 amperes.	Loss .5 % or .5 volts, use table No. 1.
100 " " .5 " "	1. " " " 2
100 " " .5 " "	2.2 " " " 3
100 " " .5 " "	4.4 " " " 4
100 " " .5 " "	8.8 " " " 5
For a 110 volt lamp, taking .5 amperes.	Loss .45 % or .5 volts, use table No. 1.
110 " " .5 " "	.9 (ap.) 1. " " " 2
110 " " .5 " "	2. " " " 3
110 " " .5 " "	4. " " " 4
110 " " .5 " "	8. " " " 5
For a 110 volt lamp, taking .45 amperes.	Loss .41 % or .45 volts, use table No. 1.
110 " " .45 " "	.8 (ap.) .9 " " " 2
110 " " .45 " "	1.8 " " (approx.) " 3
110 " " .45 " "	3.6 " " (approx.) " 4
110 " " .45 " "	7.2 " " (approx.) " 5

## THREE WIRE SYSTEM.

For a 100 volt lamp, taking .5 amperes.	Loss .55 % or .55 volts per lamp, use table No. 3.
100 " " .5 " "	1.1 " " " 4
100 " " .5 " "	2.2 " " " 5
For a 110 volt lamp, taking .5 amperes.	Loss .5 % or .55 volts per lamp, use table No. 3.
110 " " .5 " "	1. " " " 4
110 " " .5 " "	2. " " " 5
For a 110 volt lamp, taking .45 amperes.	Loss .45 % or .5 (approx.) use table No. 3.
110 " " .45 " "	.9 (approx.) " " " 4
110 " " .45 " "	1.8 (approx.) " " " 5

## MOTOR CURRENTS.

For a 50 volt circuit, and a loss of 2 % or 1. volt, use table No. 1.
50 " " " 4. " " " 2
50 " " " 8.8 " " " 3
50 " " " 17.6 " " " 4
For a 55 volt circuit, and a loss of 1.8 (ap.) 1. volt, use table No. 1.
55 " " " 3.6 (ap.) 2. " " " 2
55 " " " 8. " " " 3
55 " " " 16. " " " 4
For a 75 volt circuit, and a loss of 1.3 (ap.) 1. volt, use table No. 1.
75 " " " 2.7 (ap.) 2. " " " 2
75 " " " 5.9 (ap.) 4.4 " " " 3
75 " " " 11.7 (ap.) 8.8 " " " 4
For a 100 volt circuit, and a loss of 1. % or 1. volt, use table No. 1.
100 " " " 2. " " " 2
100 " " " 4.4 " " " 3
100 " " " 8.8 " " " 4
100 " " " 17.6 " " " 5
For a 110 volt circuit, and a loss of .9 (ap.) 1. volt, use table No. 1.
110 " " " 1.8 (ap.) 2. " " " 2
110 " " " 4. " " " 3
110 " " " 8. " " " 4
110 " " " 16. " " " 5
For a 220 volt circuit, and a loss of .9 (ap.) 2. volt, use table No. 2.
220 " " " 2. " " " 3
220 " " " 4. " " " 4
220 " " " 8. " " " 5



## WIRING TABLES

Continued.

## WIRING TABLE NO. 2.

Giving the maximum distances in feet up to 1000, to which each size of wire will carry any given number of lamps at the following losses:

**For Motor Currents.** (For "lamps" read "amperes.")

**2 % loss for a 75 volt lamp taking .75 ampere.** Loss 1.5 volts.

**4 % loss for a 50 volt lamp taking 1. ampere.** Loss 2. volts.

**4 % loss for a 55 volt lamp taking 1.1 ampere.** Loss 2.2 volts.

**3.6 % loss for a 55 volt lamp taking 1. ampere.** Loss 2. volts.

**1.6 % loss for a 75 volt lamp taking .6 ampere.** Loss 1.2 volts.

**1 % loss for a 103 volt lamp taking .5 ampere.** Loss 1. volt.

**.9 % loss for a 110 volt lamp taking .5 ampere.** Loss 1. volt.

**.8 % loss for a 110 volt lamp taking .45 ampere.** Loss .9 volt.

**DIRECTIONS:** From the number of lamps at the top, follow downward to the required number of feet, thence to the right or left to the gauge number.

B. & S. Gauge.	NUMBER OF LAMPS.																				DISTANCES IN FEET.										B. & S. Gauge.
	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	25	30	35	40	45	50	55	60	65	70	80	90	100		
	For 1 ampere lamps is indicated thus: f Small numbers are for .76 ampere lamps only.																														
16	244	122	81	61	49	41	34	30	27	24	20	17					H	E	A	T	I	N	G		L	I	M	I	T	16	
15	308	154	103	77	62	51	44	38	34	31	26	22	19																		15
14	388	194	129	97	78	65	56	48	43	39	32	28	24	22	19																14
13	488	244	163	122	98	81	70	61	54	49	41	35	30	27	24	22	20														13
12	616	308	205	154	123	103	88	77	69	62	51	44	38	34	31	26	22														12
11	776	388	258	194	155	129	112	97	87	78	65	56	48	43	39	35	31	28													11
10	980	490	327	245	196	163	140	122	109	98	82	70	61	54	49	45	39	33	28	25											10
9	617	413	309	247	206	176	154	138	123	108	88	77	69	62	57	50	41	35	31	28	25										9
8	778	519	389	311	259	222	195	174	150	130	111	97	87	78	71	62	52	45	39	35	31	28	25								8
7	982	656	491	393	327	281	245	219	196	164	140	123	109	98	89	79	66	56	49	44	39	35	31	28							7
6	827	619	496	413	355	309	276	243	208	177	155	138	124	113	99	83	71	62	55	50	45	41	39	35	31						6
5		780	624	520	447	390	348	312	280	233	195	174	156	141	124	104	89	78	70	62	57	52	48	45	39	35	31				5
4		934	788	657	564	492	439	394	328	281	246	219	197	178	158	132	113	98	88	79	72	66	61	56	49	44	39				4
3		992	827	711	620	553	496	414	356	310	276	248	225	198	165	141	128	110	99	91	83	77	71	62	55	50					3
2			896	788	697	626	522	447	391	348	313	285	260	238	208	178	156	139	126	114	106	97	90	78	70	63					2
1				987	880	790	658	504	494	394	395	366	316	282	225	197	175	157	144	131	121	112	99	88	79						1
0									995	829	711	622	553	497	452	398	331	283	248	220	198	181	164	153	142	124	110	100			0
00									896	784	697	627	570	502	418	368	314	279	251	228	209	193	179	167	140	126					00
000									988	880	791	720	633	528	452	396	332	288	264	244	226	198	176	168							000
0000									998	908	799	696	571	500	444	400	363	333	307	285	260	222	200								0000

THESE TABLES MUST NOT BE USED for successive parts of branched circuits, unless the loss represents only a PORTION of the total loss.

Copyright, 1891, by CARL HERRING.

## WIRING TABLES

Continued.

## WIRING TABLE No. 3.

Giving the maximum distances in feet up to 1000, to which each size of wire will carry any given number of lamps at the following losses:

## For the Two Wire System.

2  $\frac{1}{2}$  loss for a 110 volt lamp taking .5 ampere.  
 8.8  $\frac{1}{2}$  loss for a 50 volt lamp taking 1 ampere.  
 8.8  $\frac{1}{2}$  loss for a 55 volt lamp taking 1.1 ampere.  
 8.8  $\frac{1}{2}$  loss for a 55 volt lamp taking 1 ampere.  
 8.8  $\frac{1}{2}$  loss for a 55 volt lamp taking 1.1 ampere.  
 4.4  $\frac{1}{2}$  loss for a 75 volt lamp taking .75 ampere.  
 3.5  $\frac{1}{2}$  loss for a 75 volt lamp taking .5 ampere.  
 2.2  $\frac{1}{2}$  loss for a 100 volt lamp taking .5 ampere.  
 1.8  $\frac{1}{2}$  loss for a 110 volt lamp taking .45 ampere.

## For the Three Wire System.

.55  $\frac{1}{2}$  loss for a 100 volt lamp taking .5 ampere. Loss .55 volt per lamp.  
 .5  $\frac{1}{2}$  loss for a 110 volt lamp taking .5 ampere. Loss .55 volt per lamp.  
 .45  $\frac{1}{2}$  loss for a 110 volt lamp taking .45 ampere. Loss .5 volt per lamp.  
 For Motor Currents. (For "lamps" read "amperes.")  
 8.8  $\frac{1}{2}$  for a 50 volt circuit. 4  $\frac{1}{2}$  for a 110 volt circuit.  
 5.9  $\frac{1}{2}$  for a 75 volt circuit. 2  $\frac{1}{2}$  for a 220 volt circuit.  
 4.4  $\frac{1}{2}$  for a 100 volt circuit.

DIRECTIONS: From the number of lamps at the top, follow downward to the required number of feet, thence to the right or left to the gauge number.

B. & S. Gauge.		NUMBER OF LAMPS.																				B. & S. Gauge.																		
1	2	3	4	5	6	7	8	9	10	12	14	16	18	20	22	25	30	35	40	45	50	55	60	65	70	80	90	100												
DISTANCES IN FEET.																																								
16	536	268	179	134	107	89	76	67	59	54	44	38	33	29	27	25														16										
15	675	338	226	169	135	112	96	84	75	68	56	48	42	38	34	31	27													15										
14	852	426	284	213	170	143	121	106	95	85	71	60	53	48	43	39	34	28												14										
13		538	358	269	215	179	153	134	119	108	89	77	67	60	54	49	43	38	31											13										
12			677	451	338	271	225	183	160	156	132	112	96	84	75	68	62	54	45	39	34	30								12										
11				854	569	427	342	284	244	218	190	171	142	122	106	95	85	78	67	49	43	38	34							11										
10					718	538	431	359	307	269	239	215	179	153	134	120	108	98	86	72	62	54	48	43	40	36				10										
9						906	680	544	453	388	340	302	272	236	194	170	151	136	123	109	91	78	68	60	54	50	45	42	39		9									
8							856	685	571	489	428	380	342	285	244	214	190	171	156	137	114	98	86	76	69	63	57	53	49	43	38	8								
7								864	720	617	540	480	432	360	309	270	240	216	196	173	144	123	108	96	86	79	72	66	62	54	48	43	7							
6									908	778	681	605	545	454	389	340	302	272	248	218	182	156	136	121	109	99	91	84	78	69	60	55	6							
5										981	858	768	687	572	491	429	381	343	312	275	239	196	172	153	137	125	114	105	98	89	79	69	5							
4											963	866	732	619	541	481	433	394	346	289	247	210	192	173	157	144	133	123	108	96	87	4								
3												910	780	683	607	546	496	437	364	312	273	243	218	198	182	168	156	136	121	109	9	3								
2													953	860	765	688	626	550	459	393	344	306	275	250	229	211	196	172	153	138	2	2								
1														966	868	790	695	579	496	434	386	347	315	289	267	248	217	193	174	1	1									
0																		995	875	730	625	547	486	438	398	365	337	313	274	243	219	0								
00																			920	788	690	613	552	501	460	425	394	346	306	276	00	00								
000																				995	870	774	696	632	580	535	497	456	396	348	000	000								
0000																															975	876	796	731	674	626	548	486	430	0000

THESE TABLES MUST NOT BE USED for successive parts of branched circuits, unless the loss represents only a PORTION of the total loss.

Copyright, 1911, by CARL HERRING.

## WIRING TABLES

Continued.

## WIRING TABLE No. 4.

Giving the maximum distances in feet up to 1000, to which each size of wire will carry any given number of lamps at the following losses:

For the Three Wire System.

1 % loss for a 110 volt lamp taking .5 ampere. Loss 1.1 volts per lamp.  
 1.1 % loss for a 100 volt lamp taking .5 ampere. Loss 1.1 volts per lamp.  
 .9 % loss for a 110 volt lamp taking .45 ampere. Loss 1. volt per lamp.

For the Two Wire System.

8.8 % loss for a 75 volt lamp taking .75 ampere. Loss 6.6 volts.  
 7. % loss for a 75 volt lamp taking .6 ampere. Loss 5.3 volts.  
 4.4 % loss for a 100 volt lamp taking .5 ampere. Loss 4.4 volts.  
 4. % loss for a 110 volt lamp taking .5 ampere. Loss 4.4 volts.  
 3.6 % loss for a 110 volt lamp taking .45 ampere. Loss 4. volts.

DIRECTIONS: From the number of lamps at the top, follow downward to the required number of feet, thence to the right or left to the gauge number.

R. & S. Gauge.	NUMBER OF LAMPS																				R. & S. Gauge.														
	2	3	4	5	6	7	8	9	10	12	14	16	18	20	25	30	35	40	45	50		55	60	65	70	75	80	85	90	100					
DISTANCES IN FEET.																																			
16	536	358	268	215	179	153	134	119	107	89	76	67	59	54	43	36	31	27	24															16	
15	675	450	338	270	225	193	169	150	135	112	96	84	75	68	54	45	39	34	30	27	26												15		
14	862	568	426	341	284	243	213	190	170	142	121	106	95	86	67	49	43	38	34	31	28	26											14		
13		716	538	430	358	307	269	239	215	179	153	134	119	108	86	72	61	51	46	43	40	36	33	31	29								13		
12			903	677	542	451	387	338	301	271	225	193	169	150	136	108	90	77	68	60	54	50	45	42	39	36	34	32	30				12		
11				854	683	569	488	427	380	342	284	244	213	190	171	137	114	98	85	76	69	62	57	53	49	46	43	40	38	34	11			11	
10					861	718	615	538	478	431	369	307	269	239	215	173	144	123	108	96	86	78	72	66	62	58	54	51	48	43	10			10	
9						906	776	680	604	544	463	398	340	302	272	218	181	156	136	121	109	96	91	83	78	73	68	64	60	54	10			9	
8							978	856	761	685	571	489	428	380	342	274	228	196	171	152	137	126	114	105	98	91	86	81	76	69	63	8			8
7								960	864	720	617	540	480	432	384	288	247	216	192	173	157	144	133	123	115	108	102	96	88	7				7	
6									908	778	681	605	546	493	463	363	311	272	242	218	198	182	168	156	146	136	128	121	109	6				6	
5										981	858	763	687	550	458	392	343	305	275	250	229	211	196	183	172	162	152	137	127	5				5	
4	NOTE:—Heating limits for .5 ampere lamps on																																		
3	the two wire system are indicated thus: 1																																		
2	The small figures to the right of these lines are for																																		
1	the three wire system only.																																		
0																																	0		
00																																	00		
000																																	000		
0000																																	0000		

THESE TABLES MUST NOT BE USED for successive parts of branched circuits, unless the loss represents only a PORTION of the total loss.

Copyright, 1901, by CARL HAZEN.

## WIRING TABLES

Continued.

## WIRING TABLE No. 5.

Giving the maximum distances in feet up to 1000, to which each size of wire will carry any given number of lamps at the following losses:

## For the Three Wire System.

2 % loss for a 110 volt lamp taking .5 ampere. Loss 2.2 volts per lamp.  
 2.2 % loss for a 100 volt lamp taking .5 ampere. Loss 2.2 volts per lamp.  
 1.8 % loss for a 110 volt lamp taking .45 ampere. Loss .4 volt per lamp.

## For Motor Currents.

17.6 % loss for a 100 volt circuit.  
 16. % loss for a 110 volt circuit.  
 8. % loss for a 220 volt circuit.

## For the Two Wire System.

8.8 % loss for a 100 volt lamp taking .5 ampere. Loss 8.8 volts.  
 8 % loss for a 110 volt lamp taking .5 ampere. Loss 8.8 volts.  
 7.2 % loss for a 110 volt lamp taking .45 ampere. Loss 7.9 volts.

DIRECTIONS: From the number of lamps at the top, follow downward to the required number of feet, thence to the right or left to the gauge number.

B. & S. Gauge.	NUMBER OF LAMPS.																			B. & S. Gauge.
	3	4	5	6	7	8	9	10	12	14	16	18	20	25	30	36	40	45	50	
	DISTANCES IN FEET.																			
16	715	536	429	358	306	268	238	216	179	153	134	119	107	86	72	61	54	49	43	H E A T I N G
15	901	676	540	450	386	338	300	270	225	193	169	150	135	108	90	77	68	60	54	L I M I T
14	862	682	568	487	426	376	341	284	243	213	190	170	156	114	97	85	76	68	62	See Note.
13	860	716	614	538	478	430	388	307	269	239	216	172	143	128	108	96	86	78	72	54 51
12	903	774	677	602	542	481	387	338	301	271	217	190	165	136	120	108	99	90	83	72 68 64 60 57 54
11	976	854	759	683	629	569	498	427	380	342	278	238	195	171	152	137	126	114	105	98 91 85 81 76 72 68 64 60 57 54
10	957	861	718	616	538	478	431	345	287	245	216	191	172	157	144	133	123	115	108	103 96 91 86 82 78 74 70 66 62 58 54 50 46
9	908	776	680	604	544	485	392	311	272	243	218	198	181	167	155	145	136	128	121	116 109 9 12
8	978	856	761	685	648	589	504	424	364	324	294	238	211	196	183	171	161	153	144	137 8
7	900	864	691	576	494	432	384	343	314	288	266	247	230	216	208	199	192	182	173	7
6	871	726	622	545	484	436	396	358	335	311	291	272	266	243	229	218	210	202	194	6
5	916	786	687	610	550	500	458	423	392	366	343	324	306	289	275	26	25	24	23	5
4	990	866	770	693	630	578	538	495	452	433	408	388	368	348	334	324	314	304	294	4
3	971	874	784	728	672	624	588	546	514	486	460	437	414	396	378	360	342	324	306	3
2	999	917	847	786	734	688	646	612	580	550	524	500	476	454	432	410	388	366	344	2
1	963	926	863	816	773	732	695	661	628	596	564	532	500	468	436	404	372	340	308	1
0	973	938	878	831	788	746	704	662	620	578	536	494	452	410	368	326	284	242	200	0

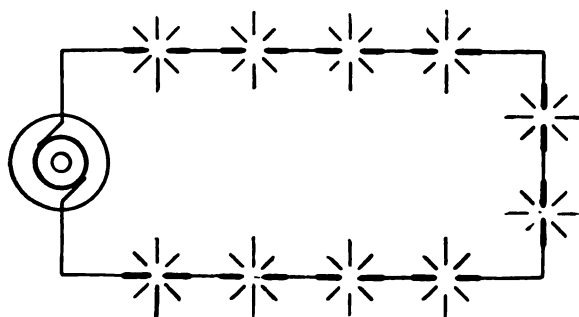
THESE TABLES MUST NOT BE USED for successive parts of branched circuits, unless the loss represents only a PORTION of the total loss.

Copyright, 1891, by CARL HERRING.

## SYSTEMS OF DISTRIBUTION OF ELECTRICAL ENERGY.

Aside from telegraphing and other methods of signaling, Electric Energy is supplied on a large scale principally to Incandescent Lights, Arc Lights, and Motors. All these devices transform Electrical Energy into some other form of energy, as light, heat, or power. These and other devices for such transformation are commonly classified as "Translating Devices," and for the purposes of arrangement, may be described as such without regard to their individual nature. Different methods and systems are used for distributing the Electrical Energy supplied to such devices, and these

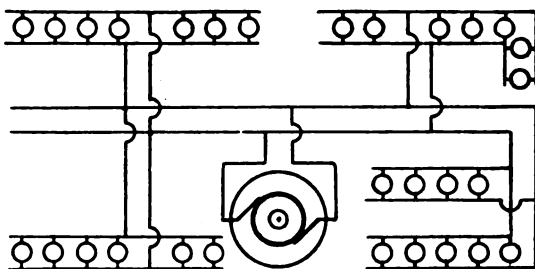
may be very briefly described as follows:



Series.

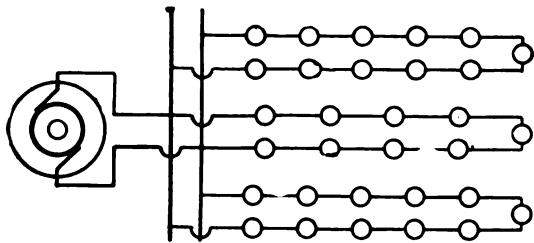
**SERIES.**—In this system the same current traverses in succession all the translating devices. The electrical pressure or voltage will vary directly as the number in circuit, the current remaining unchanged, whether one or the whole number is being supplied.

**PARALLEL OR MULTIPLE.**—In this system the pressure or voltage is constant, being that required for a single unit. The total quantity of current, however, or the amperes will vary directly as the number of units to be supplied. This system is used for all moderate sized incandescent installations, where the distance to be covered is not great.



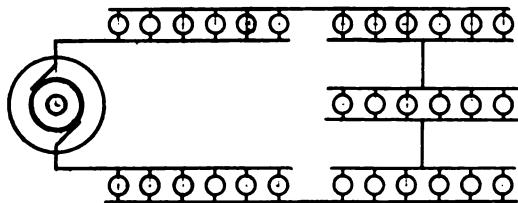
Parallel.

**MULTIPLE SERIES.**—This arrangement amounts to a combination of the two preceding, and is sometimes adopted for the sake of avoiding either a very high pressure or a very large current. In this system each series is independent of each other series, but the units in each case are dependent upon each other; thus any series may be cut out of circuit, the same as the single unit in the Parallel System.



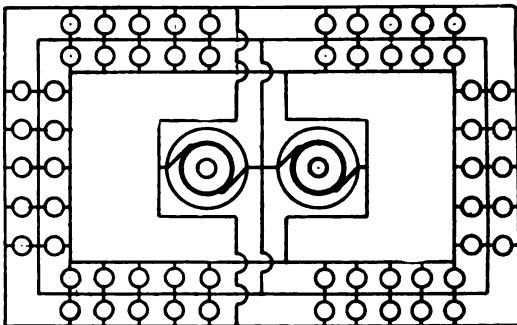
Multiple Series.

**SERIES MULTIPLE.**—In this system the total current passes through each group, being divided among the members of the group. Accordingly, both the group and the units are interdependent; while a group may be cut out, provided the circuit be not broken, the same as in the Series System one unit can not be thus cut out of a group without throwing the excess current through the other members of the same group.



Series Multiple.

**THREE WIRE.**—This system can be very easily understood if it be taken in mind that it consists simply and solely of two parallel systems joined to each other. It possesses no advantage whatever over the simple Parallel System, except a certain saving of copper, which is effected by joining together the positive of one with the negative of the other; thus when the current in the two systems is equal, no current will be flowing in the common conductor, which can be made of a size sufficient to carry the differential currents which exist when the two systems are not exactly balanced.



Three-Wire System.

The saving in the weight of copper which can be effected, varies with the conditions of use, and is limited by the fact that a considerable weight of copper is needed in the middle conductor to compensate for comparatively small differences in balance.

**NOTE.**—Alternating and other transformers can be treated as to distribution exactly like other translating devices, being in fact an intermediate translating device between the source of supply and the working units. They may be connected according to any of the above described systems, but in practice are commonly connected in simple Parallel.

## ELECTRICAL UNITS AND MEASUREMENTS.

By Prof. H. S. Carhart.

**MEASUREMENT** is the determination of one quantity in terms of another taken as the unit. Electricity has its own units with the same fundamentals of length, mass, and time as the mechanical units in the metrical system. The fundamentals, in terms of which all other units are expressed, are the centimeter, gramme, and second. The C. G. S. system takes its name from the initials of the three.

The units for practical use are multiples or submultiples of the C. G. S. units. They are the following:

1. The **OHM** ( $10^9$  C. G. S. units), or the unit of resistance, *R*. The legal ohm is the electrical resistance of a column of pure mercury one square millimeter in section and 106 centimeters long at  $0^\circ$  C., or the temperature of melting ice. This value does not correspond exactly to the theoretical value of the ohm. It is probable that the mercurial column should be 106.3 centimeters in length, or the true ohm is nearly three-tenths per cent. larger than the legal ohm. But the larger the unit the smaller the numerical value of any quantity measured by it. Hence a resistance is smaller expressed in true ohms than in legal ohms by nearly three-tenths per cent. The legal ohm is equal to 1.0114 B. A. units. A meg-ohm is a million ohms.

2. The **AMPERE** ( $10^{-1}$  C. G. S. units), or the unit of current strength, *C*. A current has a strength of one ampere when it will deposit by electrolysis, under suitable conditions, 0.0011794 grammes (0.017253 grains) of silver, or 0.0003287 grammes (0.005072 grains) of copper, per second. The ampere deposits 4.0246 grammes of silver in one hour. A milliampere is a thousandth of an ampere.

3. The **VOLT** ( $10^8$  C. G. S. units), or the unit of electro-motive force, or electric pressure, *E. M. F.* The volt is defined by reference to the units of resistance and current. It is that *E. M. F.* which will impel a current of one ampere through a resistance of one ohm. Practically, the ampere is fixed, and the value of the volt is proportional to that of the ohm. The true volt is, therefore, about three-tenths per cent. larger than the legal volt.

4. The **COULOMB** ( $10^{-1}$  C. G. S. units), or the unit of quantity, *Q*. It is the quantity of electricity transferred by an ampere, per second. A micro-coulomb is a millionth of a coulomb.

5. The **FARAD** ( $10^9$  C. G. S.), or the unit of capacity, *F*. A condenser has a capacity of one farad when it holds one coulomb, with a potential difference between its terminals of one volt. A microfarad is a millionth of a farad. Since capacity is inversely as potential difference, the legal is smaller than the B. A. microfarad. A one-third B. A. microfarad condenser is 0.3371 legal microfarad, and conversely one-third legal microfarad equals about 0.33 B. A. microfarad.

6. The **JOULE** ( $10^7$  ergs), or the unit of work measured electrically. When one coulomb of electricity has passed through a circuit under an electric pressure of one volt, the generator has done work equal to one Joule, or 0.7374 foot-pound. The continued product of current, time in seconds, and *E. M. F.* gives the energy transformed in Joules.

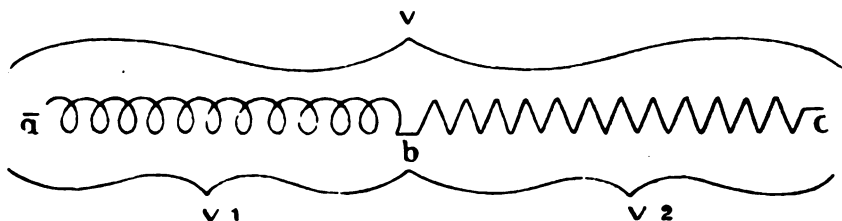
7. The **WATT** ( $10^7$  ergs per second), or the unit of power or rate of doing work, *W*. A joule per second is a watt. A current of one ampere, under a pressure of one volt, represents one watt of power. One horse-power is equal to 746 watts. A current of 10 amperes and 74.6 volts, *E. M. F.*, is equivalent to one horse-power. The horse-power equivalent of any direct current is expressed by the following relation:

$$H. P. = \frac{\text{amperes} \times \text{volts}}{746}$$

The electric pressure is distributed throughout those portions of the circuit containing no source of E. M. F., in proportion to the resistance of the various parts of the circuit.

8. The HENRY ( $10^9$  C. G. S. units), or the unit of self-inductance. The name "Henry" has not yet received official sanction. The unit of self-induction has been called the sec-ohm and the quadrant. The unit of self-induction is the induction, or number of lines of force linked with the circuit, conveying a current of one ampere, when removed from all other circuits. Its dimensions are those of a length, and its applications are precisely the same as those of the ohm.

COUNTER E. M. F. Whenever a current does work in addition to the heating of the circuit, a counter or back electro-motive force is induced. The only reaction that the agent can offer to the work done is, under electric pressure, must be of the same kind as that of the activity, viz., an E. M. F. The effective E. M. F., producing the current, is the applied E. M. F. less the back E. M. F., arising from the fact that work of some kind is done by the current against a resistance. A familiar illustration is that of a generator driving a motor. To find the E. M. F. available to produce a current, the back electric pressure produced by the motor must be subtracted from the E. M. F. of the generator. In charging an accumulator, when the work done consists in the electrolysis of the battery fluid and other decompositions, the difference between the E. M. F. of the generator and that of the accumulator is the effective pressure to produce a current. The work done, however, is measured as usual by the product of the current, and the total applied E. M. F. For example: Suppose a storage battery of 30 cells, each with a resistance of 0.02 ohm, and an E. M. F. of 2 volts. The total resistance is then  $30 \times 0.02 = 0.6$  ohm, and the back E. M. F.  $30 \times 2 = 60$  volts. If the generator applies with battery, an E. M. F. of 72 volts, the effective E. M. F. will be  $72 - 60 = 12$  volts, and the charging current 20 amperes. The energy expended on the battery will be  $72 \times 20 = 1,440$  watts, or a little less than two horse-powers. In alternating currents, the quantities measured by the ammeters and volt meters, usually applied, are not the mean values of the currents and the E. M. F.s, respectively, but the square roots of their mean squares. The power or activity of an alternating current can not be obtained by taking the product of the indications of the ammeter or volt meter, as in the case of direct currents, because the current and E. M. F. usually differ in phase. The power given to any circuit may be measured most readily by the recent method of Professor Ayton, as follows:



Let a non-inductive resistance,  $bc$  of  $r$  ohms, be placed in series with the circuit  $ab$ ; let  $V$  be the apparent potential difference in volts between  $a$  and  $c$ ;  $V_1$ , that between  $a$  and  $b$ ; and  $V_2$ , that between  $b$  and  $c$ .

Then the mean watts,  $W$ , supplied to the circuit  $ab$ , whatever the nature of the current, will be,

$$W = \frac{1}{2r} (V^2 - V_1^2 - V_2^2)$$

## GENERAL INSTRUCTIONS

### TO EMPLOYEES OF CENTRAL STATION ELECTRIC LIGHTING PLANTS.

Below we print, by permission, extracts from the General Instructions issued by Mr. Jas. I. Ayer, General Manager of the Municipal Electric Lighting and Power Co., St. Louis, and President of the National Electric Light Association.

1. When cutting wire grip the line with the cutting-jaws of pliers, and move up and down at right angles with the wire two or three times, so that you cut the insulation part way round on both sides; then hold your pliers firmly, bend the wire once or twice up and down with your left hand and the wire will break. Never try to break the wire by twisting your pliers, unless you first move the line out of the cutting-jaws. There is no excuse for nicks in the cutting-jaws of Stub's pliers, and careful linemen rarely have it happen.

2. In stripping the ends of wire to make a connection, always cut along the wire toward the end, in much the same manner as if whittling a stick. Never cut round the wire with the edge of the knife or pliers, except when cutting the wire.

3. In making joints be careful never to let the cutting-jaws or edge of your tools "score" the wire. If you do, don't cover it up, but make a new joint. Always thoroughly brighten both ends before making a joint.

4. After a joint is made, with not less than four turns each side of the connectors, dip or moisten with acid. If you are on the ground dip the joint in melted solder, and hold it there a few seconds to thoroughly heat the joint, then take it out; if well "tinned" dip it in water, to remove any acid which may be on the ends of the wire near the insulation.

5. If where you can not dip the joint, but have to use the ladle, pour the solder frequently over the joint until it leaves a thin, smooth coating on the wire. It is not properly done if the solder is in lumps or in a thick layer.

6. If you are obliged to use a "blow pot," hold the joint in the flame until the solder will easily melt when held against the wire after the flame is removed. When this is accomplished, apply the solder with the flame, AND NOT BEFORE.

7. Solder is put on the joint to keep it from corroding, thereby insuring good contact where the two wires come together, and is of no use if not well applied.

8. After the joint is well cleaned of acid, after being soldered, paint it

thoroughly with insulating compound, then cover with a layer of tape, which you will start on one side of the joint against the insulation on the wire, but not over it. Have the first layer cover the joint and bare wire only ; when this is done paint it, then start back over the joint and tape until you have run over the line insulation about two inches, then wrap two more layers (painting each when done).

9. In wrapping tape, cover what you have laid half way, or lap one-half. After four layers are on, paint the whole thoroughly.

10. Whenever you find a break in the insulation on the line anywhere, paint it first, then tape and paint it. Don't forget this.

11. In tying-in never draw the tie wire so as to bend a kink in the line, or cut through the insulation with the tie. A tie will properly hold the wire in place without drawing it so tight as to do either.

12. In using pulley blocks on the line avoid the use of "come alongs," when possible, by taking a series of half hitches or making a "noose wrap" with a small line on the wire to hook the blocks to. If you do use "come-alongs," see that you don't score, cut, or kink the wire, and always paint and tape broken insulation.

13. Ground men are especially cautioned to watch the line in "paying out," and prevent "kinking." Should a short kink get pulled into the line, cut it out rather than take the risk of its breaking, though you should straighten it out.

14. Never use porcelain knobs where exposed to moisture or the weather, and never use them anywhere else if glass can possibly be used.

15. Porcelain knob circuit-breaks may be used where necessary, providing not more than two lamps are on the loop. In making them, paint and insulate with tape the joints in connecting wire of loop.

16. Never place the line where it can get against a sign, cornice, roof, pole, or anything else, where exposed to the weather, unless it would first rest against glass. Rubber tubing is not safe as a guard where exposed to moisture or the weather. Use iron brackets and glass tubing always in such places.

17. Always run wires in straight parallel lines, and make square turns where possible. Twelve inches between wires is the proper space for arc-lighting circuits, where practicable.

18. Never fasten a cut-out box against the wall, always place glass or porcelain knobs between the box and wall.

19. Never fail to put in "drip loops" in line where entering buildings. In all electrical work remember where insulation is desired it can never be TOO GOOD, or when contact is desired can you ever make it TOO GOOD OR STRONG.

20. In removing lamps ordered out, always close the loop at the line

where it was originally cut in, and remove all dead wire. Never leave dead or unnecessary wire in circuit.

21. Always use iron pins on arms where wires turn a corner or leave the line.

22. NEVER SCREW AN INSULATOR ON IRON PIN OR CIRCUIT-BREAK VERY TIGHT, NOR WITHOUT FIRST PUTTING INSIDE THE GLASS A STRIP OF PAPER FOLDED TWICE OR THREE TIMES, OR A PIECE OF RAG. THIS WILL PREVENT THE GLASS BEING BROKEN, AS IRON EXPANDS WITH HEAT NEARLY TWICE AS RAPIDLY AS GLASS, AND UNLESS THERE IS ROOM ENOUGH, THE DIFFERENCE IN TEMPERATURE BETWEEN WINTER AND SUMMER WOULD BURST INSULATORS IN SUMMER WHICH WERE PLACED IN WINTER.

23. In connecting line to lamps hung from suspension wire, put on safety loops by making a half connection with a short wire each side of the insulators at the pole and on lamp hood. Solder and tape same as other joints. ARRANGE THE LENGTH OF THE WIRES LEADING TO LAMP SO THE LAMP FRAME WILL NOT SHADOW THE ROADWAY OF EITHER STREET.

24. Never tape a joint until it is soldered. Leave it bare until it can be properly finished, if you are compelled to so leave it, and never leave it unsoldered 24 hours.

25. ALWAYS AVOID TEMPORARY WORK. Your orders are at all times to do what you do thoroughly.

26. When working on a circuit always keep it "closed," unless you are able to have it tested O. K. during the day from the station at 1 o'clock, and from 3 to 4, or as agreed with Chief Inspector.

27. When placing guard wires on street crossings, always use iron pins and glass insulators to attach both ends of guard wires to; never tie on cross-arm or pole. In stormy weather, when they may be of use, they would be dangerous every way.

28. In working on lines all circuits must AT ALL TIMES be regarded AS ALIVE AND GROUNDED. The line you are on may "come alive" any time—be careful.

29. Be careful that all tools are securely fastened in your belt when working on pole or ladder, and in handling wire and lines on poles, have a proper regard for the safety of those walking or driving below.

30. When working on poles, always use your safety belts as well as other safety devices you are requested to use. It takes but little time to make yourself safe, and many weeks to mend a broken bone.

31. Never lay tools down when above the ground.

32. You should take necessary time and precaution for your own and the protection of others at all times.

## INDEX TO TRADE NUMBERS.

	Page.		Page.
T. 0000, B. 0000 .....	13	C. 401, C. 405 .....	18
F.P. 0000 .....	14	S. 401, S. 405 .....	18
00004 L., 00002 L. ....	15	412, 413 .....	78
0004 L., 0002 L. ....	15	B. 412, T. 412 .....	13
T. 00, B. 00 .....	13	F.P. 412 .....	14
004 L., 002 L. ....	15	420, 423 .....	78
0152 L., 0154 L. ....	15	425, 440 .....	75
F.P. 015 .....	14	441, 446 .....	78
B. 015, T. 015 .....	13	451, 452 .....	122
0528 .....	16	455, 456 .....	122
Fig. 1, Fig. 22 .....	20, 23	459, 460 .....	122
5 .....	162	464, 468 .....	120
7 .....	162	473, 474 .....	119
12 .....	162	475 .....	77
32, 33 .....	119	478, 479 .....	164
39 .....	11	482, 483 .....	124
41 .....	10	484, 486 .....	77
44, 45 .....	7	487, 490 .....	125
48, 49 .....	8	491, 494 .....	125
104, 105 .....	155	497, 498 .....	164
107 .....	155	500 .....	436
B. 108, T. 108 .....	13	B. 510, T. 510 .....	13
109, 111, 114, 115 .....	155	F.P. 510 .....	14
B. 114, T. 114 .....	13	510, 510 B. ....	436
F.P. 108, F.P. 114, F.P. 127 .....	14	540, 540 B. ....	436
B. 127, T. 127 .....	13	B. 610, T. 610 .....	13
B. 146, T. 146 .....	13	F.P. 610 .....	14
F.P. 146 .....	14	611 .....	434
B. 166, T. 166 .....	13	620 .....	434
F.P. 166 .....	14	635 .....	435
170 .....	380	641 .....	434
B. 184, T. 184 .....	13	646 .....	435
F.P. 184 .....	14	655, 655 H., 656 .....	415
186, 196, 198, 200 .....	380	664 .....	430
202, 204 .....	18	666 .....	432
202, 204 .....	380	671 .....	429
B. 214, T. 214 .....	13	682 .....	440
F.P. 214 .....	14	700, 701 .....	442
220, 248 .....	28	704, 723 .....	28
273, 282 .....	29	S.P. 711, S.B. 714 .....	14
T. 291 .....	407	S.B. 715, S.B. 716, S.B. 718 .....	14
283, 293 .....	29	730 .....	442
T. 292 .....	408	766 .....	191
T. 293, T. 296 .....	409	768, 769 .....	190
H. 300 .....	380	771, 772 .....	189
H. 300 .....	17	774, 776 .....	189
H. 301, H. 304 .....	380	778, 779 .....	188
H. 301, H. 304 .....	17	780 .....	192
T. 302, T. 304 .....	410	792 .....	188
T. 305, T. 309 .....	404	793 793 W. ....	190
306, 308, 310, 312 .....	390	794, 797 .....	171
B. 313, T. 313 .....	13	799 .....	174
F.P. 313 .....	14	801 .....	191
320, 350 .....	28	803, 803 W. ....	127
345, 346 .....	390	809 .....	97
349 .....	390	804, 823 .....	28
351, 352 .....	28	805, 808 .....	98
351, 353 .....	390	B. 810, T. 810 .....	13
351, 384 .....	389	F.P. 810 .....	14
389, 390 .....	389	810, 811 .....	95
392 .....	389	813, 814, 818 .....	93
400 .....	78	815 .....	96
S. 400, C. 400 .....	18	817 .....	92
401, 406 .....	78	821, 822 .....	95

INDEX TO TRADE NUMBERS—*Continued.*

	Page.		Page.
823, 830.....	189	1082, 1083.....	39
831, 832.....	192	1082 L., 1084 L.....	15
866, 869.....	180	1085, 1086.....	61
875.....	173	1092, 1094.....	166
877, 877 W.....	180	1095.....	92
879.....	174	1096, 1097.....	83
881, 885.....	127	1109, 1112.....	36
881 W., 885 W.....	127	1109, 1112.....	90
898, 899.....	57	1113, 1114.....	91
901.....	56	1125, 1126, 1127½.....	91
903.....	54	1135, 1137.....	91
905.....	53	1142 L., 1144 L.....	15
906.....	55	1175, 1176, 1177, 1178.....	94
908.....	52	1181, 1185.....	128
909.....	51	1181 W., 1185 W.....	128
910.....	59	1186, 1187.....	126
913, 915, 914 B., 917, 918.....	41	1189.....	59
916.....	48	1191, 1192.....	128
925, 925 P., 925 C., 925 F.....	50	1201, 1203, 1204.....	79
927, 929.....	37	1206, 1206 B.....	80
931, 933.....	37	1207, 1207 B.....	80
936, 938.....	37	1210, 1210 B.....	80
939.....	85	1212.....	79
947, 948.....	40	1213.....	81
949, 950.....	37	1221, 1224.....	81
949 C., 950 C.....	37	1231, 1233, 1239.....	82
951.....	88	1271, 1275.....	168
952.....	84	1272 L., 1274 L.....	15
953, 954, 955.....	86	1277.....	168
956, 957.....	87	1280.....	168
958.....	83	1288, 1291.....	170
963.....	85	1301, 1303.....	364
962, 965, 968.....	66	1305, 1307.....	364
971, 973, 975.....	66	1310, 1314.....	364
961, 966, 966.....	62	1316, 1320.....	364
961, 970, 972, 983.....	64	1325, 1330.....	364
977, 981, 981 A.....	65	1335, 1340.....	364
982, 982 A.....	65	1350, 1360.....	364
976, 979, 980.....	63	1370, 1390.....	364
988.....	40	1381, 1386.....	169
989.....	84	1391, 1393, 1395.....	169
991, 992.....	166	1400.....	364
993.....	165	1414.....	431
994.....	166	1425.....	364
995, 999.....	166	1428.....	439
1000.....	165	1450.....	364
1001, 1002.....	47	1453, 1457.....	129
1004, 1006.....	43	1460.....	129
1007, 1009.....	44	1461, 1462.....	60
1010, 1012, 1015.....	45	1462 L., 1464 L.....	15
1016, 1017.....	372	1463, 1467.....	129
1016, 1018.....	46	1475.....	364
1013, 1014.....	47	1480.....	364
1019, 1020.....	89	1488.....	16
1023, 1029.....	38	1494, 1496.....	130
1026 G., 1028 G.....	38	1500.....	134
1033.....	40	1501, 1502, 1504.....	327
1039, 1040.....	165	1506.....	329
1041, 1043.....	167	1507, 1507 M.....	329
1044.....	165	1509, 1509 M., 1510, 1510 M.....	328
1048, 1048½, 1049.....	90	1511, 1512.....	329
1050.....	39	1513, 1514, 1515.....	330
1053, 1057, 1058.....	89	1514 B.....	330
1060, 1061.....	67	1517.....	347
1067.....	89	1523, 1524, 1524 B.....	347

INDEX TO TRADE NUMBERS—*Continued.*

	Page.		Page.
1531, 1533, 1535.....	346	1938, 1935, 1937.....	333
1537, 1544, 1546.....	346	1939, 1941.....	334
1557, 1559, 1561.....	331	1945, 1947, 1949.....	335
1564.....	330	1960, 1962.....	336
1566, 1567, 1568.....	332	1970.....	336
1568 M.....	332	1983, 1986.....	337
1570.....	319	1998.....	339
1582, 1582 N., 1582 J.....	319	2000.....	339
1583.....	322	2001.....	340
1590.....	320	2005, 2006.....	339
1620.....	320	2012, 2013.....	345
1630, 1631.....	321	2020.....	341
1634.....	323	2030.....	341
1640.....	321	2032.....	341
1650.....	323	2037.....	326
1660.....	320	2048.....	340
1662 L., 1664 L.....	15	2049.....	343
1670.....	322	2050.....	342
1685.....	338	2052.....	342
1688.....	338	2054, 2055.....	342
1690.....	310	2057.....	342
1700.....	310	2059.....	313
1710.....	319	2060.....	344
1720, 1722.....	301	2062.....	344
1724, 1725.....	301	2077.....	340
1726, 1728.....	76	2083.....	350
1740.....	301	2086, 2087.....	345
1742.....	300	2090.....	324
1745.....	297	2091, 2091 B.....	323
1748.....	294	2094.....	326
1750.....	297	2095.....	324
1761, 1763.....	288	2096, 2099.....	325
1765.....	288	2101.....	324
1778, 1775.....	288	2106.....	324
1792, 1794, 1797.....	288	2107.....	323
1799, 1800.....	309	2128.....	349
1801, 1803, 1807.....	289	2130.....	348
1810, 1811.....	289	2131.....	349
1812, 1814, 1815.....	290	2133.....	349
1818, 1820.....	290	2134, 2135.....	348
1821, 1835.....	308	2137.....	350
1836, 1839.....	309	2142 L., 2144 L.....	15
1840.....	291	2150.....	348
1842 L., 1844 L.....	15	2180.....	310
1858, 1860.....	291	2190.....	310
1871, 1873, 1875.....	292	2192.....	374
1891, 1893, 1895.....	293	2195.....	374
1897.....	293	2196.....	375
1898.....	294	2197.....	310
1900 S.....	296	2198.....	375
1901.....	296	2200.....	375
1910 S.....	296	2201.....	302
S. B. 1911.....	14	2203.....	302
1912.....	296	2204.....	304
S. B. 1912.....	14	2205.....	305
1914.....	296	2206.....	304
S. B. 1914, S. B. 1915.....	14	2208.....	307
1916.....	296	2211.....	305
S. B. 1916, S. B. 1917.....	14	2213.....	306
1917, 1920.....	295	2216.....	307
1921, 1921½.....	296	2221, 2224.....	306
1923, 1923½.....	296	2228.....	306
1924, 1924 V.....	294	2231.....	306
1928, 1929.....	295	2234, 2235.....	307
1930.....	333	2241 B., 2241 T., 2241 W.....	368

INDEX TO TRADE NUMBERS—*Continued.*

	Page.		Page.
2251, 2252.....	368	2692.....	394
2266, 2267, 2268.....	315	2748, 2750.....	140
2269.....	313	2751, 2761.....	140
2273.....	314	2768, 2769.....	395
2275.....	314	2771, 2772.....	395
2277.....	313	2780, 2789.....	396
2278.....	314	2792, 2794.....	397
2282, 2283.....	326	2799.....	416
2292.....	338	2806, 2808.....	111
2294.....	338	2812, 2813.....	110
2296.....	338	2921, 2925.....	48
2302.....	318	2931, 2935.....	48
2307.....	318	2942, 2943.....	106
2309.....	318	2945, 2946, 2947.....	107
2311.....	310	2949.....	107
2316.....	316	2951, 2953.....	136
2331.....	316	2957, 2958.....	135
2333.....	316	2957 W., 2958 W.....	135
2336.....	317	2961, 2962, 2963.....	133
2340.....	317	2964.....	134
2350.....	195	2971, 2973.....	172
2353.....	195	2981, 2985.....	179
2355, 2356.....	195	2986.....	180
2359, 2360.....	209	2988, 2988 F.....	178
2388.....	426	2992 W., 2993 W.....	178
2397, 2400.....	124	2992, 2993.....	178
2404.....	351	2994, 2997.....	176
2411.....	39	3008, 3013.....	181
2411.....	426	3014.....	183
2417.....	425	3015, 3019.....	182
2421.....	427	3020.....	184
2426, 2427.....	57	3021, 3022.....	185
2428, 2429.....	303	3023, 3024.....	186
2432.....	307	3025.....	183
2449.....	425	3033.....	183
2472.....	16	3036, 3041.....	268
2475.....	83	3045, 3049.....	269
2496, 2500.....	399, 400	3053, 3057.....	270
2496, 2500.....	137	3077, 3080.....	271
2501, 2511.....	138	3081.....	317
2501, 2511.....	401	3084, 3085.....	194
2512.....	403	3087.....	194
2516.....	414	3089, 3091.....	194
2518.....	414	3093.....	194
2520.....	413	3094, 3099.....	229
2522.....	413	3104, 3104 C., 3104 G.....	283
2523.....	410	3106, 3109.....	284
2524, 2529.....	412	3119, 3120.....	282
2545.....	393	3127, 3138.....	131
2546.....	392	3132 L., 3134 L.....	15
2551, 2552.....	398	3139, 3150.....	133
2558, 2559.....	141	3164.....	366
2563, 2564.....	398	3168.....	366
2566, 2568.....	398	3173.....	366
2587.....	184	3178.....	366
2588, 2589.....	187	3183.....	367
2592, 2595.....	108	3185.....	367
2599.....	143	3192.....	367
2650.....	441	3199, 3199 N.....	234
2651.....	441	3201.....	234
2675.....	411	3203.....	236
2677.....	411	3204.....	237
2679, 2682.....	402	3206, 3208.....	238
2679, 2682.....	13	3212.....	367
2684, 2689.....	322	3224.....	367

INDEX TO TRADE NUMBERS—*Continued.*

	Page.		Page.
3250.....	275	3631, 3633.....	229
3252.....	275	3639, 3639 H.....	109
3256.....	275	3639 G., 3639 B.....	109
3260.....	275	3640.....	109
3262.....	275	3643.....	112
3266.....	275	3644.....	113
3267, 3273.....	160	3645, 3646.....	112
3276, 3278.....	160	3647.....	372
3281, 3287.....	161	3648, 3650.....	206
3290, 3296.....	161	3651.....	371
3299.....	161	3653.....	111
3327, 3337.....	225	3655.....	271
3356, 3359.....	286	3661.....	371
3362, 3368.....	231	3663.....	371
3372, 3385.....	285	3679, 3680.....	372
3387, 3392.....	231	3681.....	371
3394, 3398.....	230	3683.....	371
3400.....	230	3685, 3685 C.....	203
3401, 3402.....	230	3685†, 3686.....	203
3447.....	16	3688, 3689.....	220
3454.....	278	3690†, 3694.....	272
3456.....	279	3696.....	272
3457, 3470, 3465 A.....	105	3697, 3698.....	214
3474, 3475.....	280	3700.....	218
3476.....	105	3701, 3703.....	218
3477, 3477 B., 3478, 3478 B.....	311	3704, 3705.....	219
3479, 3479 B., 3480, 3480 B.....	311	3706, 3709.....	212
3488, 3489.....	312	3710, 3711.....	213
3490, 3491, 3490 N., 3491 N.....	312	3713, 3713 R., 3713 P.....	198
3497, 3499.....	147	3716.....	239
3500.....	311	3717.....	236
3504.....	361	3718, 3719.....	238
3505.....	146	3720.....	235
3507, 3509.....	148	3721.....	245
3510, 3512.....	146	3722.....	240
3513.....	374	3723.....	236
3515.....	374	3724, 3725.....	245
3519.....	148	3726, 3728, 3729, 3730.....	245
3523.....	144	3731, 3732.....	237
3525, 3526.....	360	3733, 3734.....	245
3534.....	145	3735.....	236
3537.....	145	3737, 3738.....	245
3540, 3543.....	145	3739, 3740.....	235
3551, 3552.....	359	3741, 3742.....	233
3556, 3559.....	199	3743.....	236
3560, 3566.....	149	3744.....	233
3567, 3569.....	216	3745, 3747.....	235
3576, 3577.....	222	3748.....	233
3580.....	215	3749, 3749 C.....	239
3581, 3582.....	214	3750.....	249
3585, 3586.....	213	3751.....	248
3587, 3590.....	223	3751 C.....	249
3591.....	221	3752.....	246
3592, 3593.....	221	3753.....	247
3594.....	221	3754.....	248
3595, 3595 W.....	219	3755.....	247
3603, 3605 C.....	211	3756, 3760.....	245
3607.....	211	3761.....	245
3609.....	210	3762.....	226
3612, 3613.....	193	3763.....	233
3615, 3617.....	193	3764.....	226
3620, 3621.....	205	3765, 3767.....	228
3623, 3625.....	205	3768, 3770.....	232
3626, 3628.....	273	3771, 3772.....	232
3629.....	220	3780, 3782.....	232

INDEX TO TRADE NUMBERS—*Continued.*

	Page.		Page.
3783.....	227	3955, 3956.....	135
3784, 3785.....	226	3955 W., 3956 W.....	135
3790, 3793.....	233	3957, 3958.....	106
3801, 3804.....	255	3964, 3970.....	175
3806.....	255	3975.....	196
3809.....	255	3977.....	198
3811, 3815.....	255	4012, 4014.....	261
3817, 3824.....	256	4017, 4022.....	262
3825, 3832.....	255	4028, 4040.....	142
3833, 3840.....	256	4044, 4055.....	299
3841, 3845.....	255	4059.....	427
3852.....	264	4110.....	384
3854, 3855.....	262	4112.....	176
3861, 3861 G., 3861 C.....	208	4118, 4115.....	123
3863.....	207	4122 L., 4124 L.....	15
3864, 3864 R.....	222	4159, 4171.....	123
3865, 3867.....	215	4180.....	428
3868, 3869.....	259	4187.....	206
3870.....	257	4225, 4235.....	227
3871, 3872.....	258	4253.....	350
3873.....	257	4276.....	39
3877.....	257	4280, 4282.....	385
3878, 3880.....	260	4286, 4304.....	357
3884.....	264	4317, 4324.....	298
3885, 3886.....	263	4329, 4330.....	298
3888, 3889.....	258	4340, 4342, 4344.....	91
3890.....	257	4340, 4343.....	300
3891, 3893.....	261	4344, 4347.....	300
3895, 3896.....	261	4349, 4350.....	300
3901, 3902.....	225	4353, 4357.....	300
3905.....	204	4361.....	382
3906.....	259	4362, 4396.....	387
3907, 3911.....	224	4419, 4423.....	356
3912.....	226	4426.....	16
3914, 3915.....	204	4440, 4449.....	362
3916, 3917.....	59	5001.....	437
3925.....	204	5036.....	438
3926, 3933.....	193	5102 L., 5104 L.....	15
3934.....	196	5408.....	16
3935, 3936.....	197	6102 L., 6104 L.....	15
3937, 3938.....	197	6391.....	16
3939, 3940.....	197	7368.....	16
3941, 3942.....	177	8102 L., 8104 L.....	15
3944.....	177	8353.....	16
3945.....	173	9336.....	16
3946, 3947.....	194		



## ALPHABETICAL INDEX.

A		B	
	Page.		Page.
<b>Adjustable Hanger, Bradner</b> .....	200, 203	Bags, Linemen's Tool .....	318
"    Lamp Support.....	199	Balls, Cluster .....	230, 231
"    Iron Handles.....	340	Bar, Pinch.....	309
Adjuster, Lamp Cord .....	204	Bassett Combination Portable and Bracket	246
Ajax Boring Machine.....	344	Batteries .....	429, 433
"    Dry Battery .....	430	"    Medical.....	439
Alcohol Soldering Lamp .....	306	"    Testing .....	411, 412
Almonds Flexible Tube Brackets.....	234	Battery, Chloride of Silver.....	412
Alternating Station Switches.....	131, 132	"    Motors, Porter .....	286
Aluminum Shades.....	259	"    Volt Meter, Wirt Portable.....	394
Ammeters, Ayrton & Perry.....	398	Bellows, Armature .....	310
"    Weston .....	396	Bells, Electric.....	434, 435
Ampere Indicators.....	401, 402	Bell Outfits, Electric.....	437, 438
"    Indicator, B.-W. ....	139	Belt Cement, Munson.....	145
<b>Ampere Indicator, Wirt</b> .....	138	"    Clamps .....	145
"    Meter, Edison.....	140	"    Fastener, Eureka .....	145
"    "    Wirt Portable.....	394	Belting.....	143, 144
Angle Brace.....	340	Belts, Tool.....	318
Annunciators .....	440	Binding Posts.....	389, 390
Annunciator Wire .....	443	Bits, all kinds.....	342, 343
Arc Cut-out, Ayer .....	97	Blow-Pipe .....	306
"    "    Cleveland .....	95	"    "    Electricians .....	304
"    Globe Protector.....	111	"    "    Gasoline .....	305
"    Lamps .....	110, 111	Blue Vitriol.....	444
"    Lamp Ceiling Switch.....	93	Bodies, Electrolier and Chandelier.....	227
"    "    Cordage .....	91	Body, Electrolier or Cluster.....	233
"    "    Globes .....	373	Books.....	418, 424
"    "    Spark Arrester .....	113	Boring Machines, Ajax .....	344
"    "    Street Hoods.....	112	Boston Trolley.....	427
"    "    Suspending Boards.....	92, 93	Box Cluster.....	281
<b>Arc Lamp, Wood</b> .....	110	Braces, all kinds.....	340, 341
"    Light Cut-out, Dayton.....	88	"    Cross Arm.....	37
"    "    Hanger, E. S. ....	92	"    Drill.....	345
"    Switches, Rapid Transit .....	94	Brackets, Almonds Flexible Tube .....	234
Armature Bellows .....	310	"    Electric.....	234, 238
"    Twine .....	382	"    Fletcher Insulating .....	48
"    Varnish, P. & B. ....	82	"    High Insulation.....	42, 48
Arms, Electrolier.....	233	"    Iron.....	42, 48
Attachments, Gas Fixture .....	195	"    Wood.....	41
Attachment Plugs, all kinds.....	221, 223	<b>Bradner Adjustable Hanger</b> .....	200, 203
"    "    Wood's.....	198	Brass Wire, Spring.....	381
Augers .....	344	Break Arms .....	47
Auger Bit, Forstner.....	343	"    Insulator .....	57
"    Pole Hole .....	288	Brick Drill .....	345
Automatic Torch.....	306	Brush, Carbon Rod.....	310
Axes .....	335	"    Copper .....	358
Ayer Arc Cut-out.....	97	"    Globe and Dynamo.....	310
"    Spring Connector .....	77	"    Shears, Commutator.....	310
Ayrton & Perry's Ammeters .....	398	"    Snips, .....	310
"    "    Volt Meters .....	398	<b>Brushes, Dynamo</b> .....	354, 356

ALPHABETICAL INDEX—*Continued.*

	Page.		Page.
Burnley Cartridge Battery.....	432	Coe's Wrenches.....	348
Burnley-Wood Testing Battery.....	411	Combination Bracket.....	45
Bushings, Insulating.....	193	"Come Alongs".....	296
B.-W. Ampere Indicator.....	402	Commutator Brush, Copper.....	358
" " ".....	139	" " Shears.....	310
		" " Snips.....	310
		" Compound.....	359
		" Conservor.....	359
		" Copper Bars.....	387
		Compasses.....	347
<b>C</b>		Compound, Commutator.....	359
Calipers, Registering.....	347	Compounds, Insulating.....	81, 82
Canopies, Sliding.....	232	Connectors.....	78
Cant Hook.....	290	" Ayer Spring.....	77
Carbons.....	371	" Bus Bar.....	119
Carbon Brushes.....	357	" McIntire.....	75
" Cases.....	316	" Station.....	120, 122
" Holder.....	372	" Wood's Flexible Cord.....	206
" Pliers.....	321	Conover Splicing Clamps.....	301
" Rod Brush.....	310	" Water-proof Lamp Globe.....	207
Carews Wire Cutters.....	322	Conservor, Commutator.....	359
Carrying Hooks.....	290	Converter, Bracket.....	46
Ceiling Brackets.....	47	" Switch, Double Pole.....	98
" Plate for Electroliers.....	227	<b>Converters, Stanley.....</b>	<b>99, 105</b>
" Rosettes.....	170, 171	Copper, Commutator Brush.....	358
" " and Switch, Wirt.....	174	" Hammer.....	334
" Switch, Arc Lamp.....	93	" Wire.....	74
Chain, Flexible Brass.....	234	" Bars.....	119
Chandelier Bodies.....	227	" " Commutator.....	337
Chatterton's Insulating Compound.....	81	" Soldering.....	307
Chesterman's Tape Lines.....	331	Cord Adjusters, Lamp.....	204
Chisels.....	336, 337	" Connector, Wood's Flexible.....	206
Chloride of Silver Battery.....	412	" Habirshaw.....	18
Chromic Acid.....	444	" Regular.....	29
Chucks.....	350	Cored Carbons.....	371
Circuit Break, Hercules.....	83	Cores, Habirshaw Special.....	19, 23
" Loop Break.....	83	Corner Cleats, Fletcher.....	168
Clamps, Conover Splicing.....	301	" Pins.....	41
" for Stanley Motor.....	282	Cornice Bracket.....	45
" McIntire Twisting.....	76	Cotton Waste.....	374
" Wood's Universal Desk.....	210	Counter, Pole.....	330
Clark's Expansive Bits.....	342	Couplings, Hering Vise-Grip.....	77
" Standard Cell.....	410	Crescent Oil.....	360
Cleats, Fletcher's Corner.....	168	Crocus Cloth.....	375
" Kartavert Insulating.....	165	Cross Arms.....	37
" Lamp.....	89	" " Braces.....	37
" Porcelain.....	67	" " Lamp.....	83
" Wood.....	165, 168	Crow Bar.....	239
Cleveland Arc Cut-out.....	95	Crowfoot, Iron.....	226
" Transformer Cut-out.....	98	Crown Oil Filter.....	147
Climbers.....	293	Countersinks.....	350
Cluster Ball.....	230	Cut-outs.....	172, 187
" Box.....	231		
" Separable Ball.....	231		
" The E. S.....	230		

ALPHABETICAL INDEX—*Continued.*

	Page.
Cut-outs, Ayer Arc.....	97
“ Cleveland Arc.....	95
“ “ Transformer.....	98
“ Dayton Arc Light.....	88
“ Plug.....	183, 187
Cutters, Rod and Pipe.....	350

## D

Dayton Arc Light Cut-out.....	88
Desk Clamp, Wood's Universal.....	210
Detaching Cup.....	172
Diamond Carbon Battery.....	429
Digger, Pole Hole.....	288
Digging Bars.....	289
Dividers.....	347
Double Pole Fuse Rosette.....	174
Drawing Knives.....	336
Drill, Brace.....	345
“ Hollow Brick.....	345
“ Hand.....	345
“ “Jumper” Brick.....	345
“ Syracuse Brace.....	342
Drip Oiler.....	312
Driving Tools, “Safety”.....	169
Dry Battery, Ajax.....	430
D.-W. Detachable Cut-out.....	172
Dynamo Belting.....	143, 144
“ Brushes.....	354, 356
“ “ Globe and.....	310
“ Galvanometer.....	141
“ Resistance Box.....	142
“ Speed Indicator.....	313

## E

Eccentric Clamps.....	296
“ Klein's Compound.....	295
Economic Incandescent Lamp.....	271
Eddy Motors.....	285
Edison Ampere Meter.....	140
Edison-Lalande Battery.....	431
Edison Lightning Arrester.....	143
Electric Bells.....	434, 435
“ Bell Outfits.....	437, 438
“ Light Switch, plain.....	191
Electrolizer Arms.....	233
“ Bodies.....	227
“ Hook.....	229
“ Loop.....	229
Ellis Oil Filter.....	146
Emery Cloth.....	375

	Page.
Engineers Torch.....	312
E. S. Arc Light Hanger.....	92
E. S. Cluster.....	230
E. S. Incan. Snap Switch, double pole.....	190
“ “ “ single “.....	138
E. S. Rubber Tape.....	80
Eye-Bolts, Welded.....	39
Eye-Glasses, Dark.....	317

## F

Fan Motor, Gramme Type.....	283
<b>Fan Motors, Stanley</b> .....	271, 279
Feeder Lugs.....	123
Fibre, Insulating.....	384
Filters, Oil.....	146, 147
Finishing Handles.....	205
Firepot, “Helper”.....	304
Fixture Cut-outs.....	179, 180
“ Pliers.....	322
Fixtures.....	239, 245
<b>Fixture Wire, Habirshaw</b> .....	18
Flanges, Wall.....	228
Fletcher's Corner Cleats.....	168
“ Gem Wire Holders.....	163, 164
“ Insulating Bracket.....	48
“ “ Pin.....	48
“ Lamp Hanger.....	84
“ Safety Windlass.....	90
“ Sleet-proof Lamp Support.....	85
“ “ Pulleys.....	85, 87
“ Wire Holders.....	58
“ “ “.....	124, 125
“ Wiring Pendants.....	59
“ Wood Risers.....	124
Flexite Tubing.....	161
Floor Groovers.....	338
“ Insulator, Glass.....	59
Fluid Insulators, Glass.....	49, 50
Foot Regulator.....	281
Forge, Gas.....	307
Forks, Raising.....	291
Formule and Tables.....	445, 477
Forstner Auger Bit.....	343
Fowler Speed Indicator.....	314
Furnaces, Soldering.....	302, 303
Fuse Block, Plain.....	180
<b>Fuse Box, Stanley Primary</b> .....	105
“ “ Wood's Duplex.....	176
“ Holders.....	106
“ “.....	135, 136
“ Links.....	366, 367

ALPHABETICAL INDEX—*Continued.*

	Page.		Page.
Fuse Rosette, Double Pole.....	174	Handle, Adjustable Iron.....	340
" Strips.....	367	" Finishing and Socket.....	205
" Wire, Goe.....	364, 365	" Tool.....	326
<b>G</b>		<b>Hanger, Bradner Adjustable.....</b>	<b>200, 203</b>
Galvanized Guy Wire.....	86	" E. S. Arc Light.....	92
Galvanometers.....	414	" Standard Trolley Wire.....	425
Galvanometer, Dynamo.....	141	Hard Rubber Rods.....	383
" Switch.....	141	" " Sheets.....	383
Gas Fixture Attachments.....	195	" " Tubing.....	382
Gas Forge.....	307	Hart Incandescent Snap Switch.....	189
Gasoline Blow-Pipe.....	305	Hatchets, all kinds.....	334, 335
Gas Stoves.....	303	Heath Speed Indicator.....	313
Gauge, Pocket Wire and Screw.....	329	Helmet Brand Solid Oil.....	361
" Rolling Mill.....	329	Hercules Circuit Break.....	83
" Screw Thread.....	330	Hering Vise-Grip Coupling.....	77
" Self-Registering Wire.....	330	High Insulation Brackets.....	42, 46
" Standard Wire.....	327	Holland Tapes.....	381
German Silver Resistance Wire.....	381	Hoods, Arc Lamp Street.....	112
" " Wire, Insulated.....	33	Hook, Electrolier.....	229
" Twist Bit.....	342	" Socket.....	209
Gimlets, Bell Hangers.....	343	House Wire, Shield Brand.....	443
Glass Floor Insulator.....	59	Hydrometer.....	317
" Insulating Knobs.....	60	<b>I</b>	
" Line Insulators.....	49, 56	Imhauser Pole Indicator.....	413
" Shades, Incandescent.....	250, 256	Incandescent Glass Shades.....	250, 256
Globe and Dynamo Brush.....	310	<b>Incandescent Lamp Cord, Habirshaw</b>	<b>18</b>
" Arc Lamp.....	373	" " " Regular.....	29
" Conover Water proof Lamp.....	207	" " Miniature.....	272
" Nets.....	372	<b>Incandescent Lamps, Sunbeam</b>	<b>265, 270</b>
" Protector, Arc.....	111	" Lamp Support, Adjustable.....	199
" Vapor-proof.....	208	" Street Fixture, Wirt.....	109
Gloves, Rubber.....	316	" Switch, Plain.....	192
Goe Fuse Wire.....	364, 365	Indicators, Ampere.....	401, 402
Grimshaw Rubber Wires.....	28	<b>Indicator, Wirt Volt</b>	<b>399, 400</b>
" Tape.....	80	Insulated Wires, Cables, and Cords.....	5, 33
Groovers, Floor.....	338	Insulating Compound.....	370
Guard Arms.....	40	" Fibre.....	384
Guards, Lamp.....	206	" Hook, Wirt Arc Lamp.....	84
Guy Twister, Gorsuch.....	300	" Joints.....	224, 226
" Wires and Strands.....	36	" " Wirt.....	224
<b>H</b>		" Knobs, Glass.....	60
Habirshaw India-Rubber Insulation.....	12, 27	" Oil Paper.....	384
Hack Saw.....	339	" Staples.....	169
Hall's Pliers.....	319	" Tape.....	79, 81
" Vise.....	297	" Tubing, Rubber.....	162
Hammers, all kinds.....	333, 334	Insulator, Break.....	57
" Copper.....	334	" Glass Floor.....	59
Hand Drill.....	345	" " Line.....	49, 56
		" Porcelain.....	61, 67
		" Rubber Hook.....	40

ALPHABETICAL INDEX—*Continued.*

	Page.		Page.
Insulators, Tree.....	57	Levels, all kinds.....	332
Iron Crowfoot.....	226	Lightning Arrester, Edison.....	143
Iron Lamp Cord, Galvanized.....	91	"    "    Wirt.....	108
Iron Pin.....	48	"    Wrench.....	348
<b>J</b>		Line Equipment Material.....	35, 113
Joints, Insulating.....	224, 226	Linemen's Tool Belt.....	318
<b>K</b>		"    Torch.....	307
Kartavert Insulating Cleats.....	165	"    Vise, Hall.....	297
Kerite Tape.....	79	"    "    Stubs.....	297
"    ".....	369	Line Wire, P. & B. Weather-proof.....	10
Keyhole Saws.....	339	"    "    Shield Brand Moisture-proof 6,.....	9
Knife, Novelty Bell Hangers.....	323	"    "    Tightener.....	294
Knife Switch, Incandescent.....	192	"    "    Underwriters.....	11
K. W. Bracket Cut-out.....	173	Link Cut-out.....	181, 183
"    Cut-outs, Main and Branch.....	177	Locust Pins.....	41
"    Detachable Cut-out.....	173	Loop Brackets.....	43
<b>L</b>		"    Break, Circuit.....	83
Ladles, Solder.....	307	"    Electroliter.....	229
Lag Screws.....	38	"    Switch.....	95
"    "    Wrench.....	349	<b>M</b>	
Lamp Adjuster, Wood's.....	211	Magneto Testing Bells.....	415
"    Arc.....	110, 111	Magnet Wire, Cotton Wound.....	30, 31
"    Cleats.....	89	"    "    Silk.....	32
"    Cord, Galvanized Iron.....	91	Mallets, all kinds.....	337, 338
"    Cordage, Arc.....	91	Manilla Rope.....	300
"    Cord, Fireproof.....	29	Manson Tape.....	80
<b>Lamp Cord, Habirshaw</b> .....	18	Manufacturers Special Material.....	377, 390
"    "    Regular.....	29	McCreary's Flexible Brass Chain.....	234
"    Cross Arms.....	83	"    Reflector Shades.....	261, 262
"    Guards.....	206	McIntire Connectors and Clamps.....	75, 76
"    Hanger, Fletcher.....	84	McTighe Overhead Switch.....	426
"    Holder, Miniature.....	273	Medical Batteries.....	439
"    Insulating Hook, Wirt Arc.....	84	Meg-ohm Box, Standard.....	407
"    Miniature Incandescent.....	272	<b>Meter, Wirt Electricity</b> .....	275
"    Pulleys.....	89	Mica.....	385, 386
"    Rod Polishing Cloth.....	375	Micrometers, all kinds.....	328, 329
<b>Lamp, Sunbeam Incandescent</b> .....	265, 270	Miniature Incandescent Lamps.....	272
"    Support, Adj. Incandescent.....	199	"    Lamp Holder.....	273
"    "    Fletcher Sleet-proof.....	85	"    Paper Shade.....	273
<b>Lamp, Wood Arc</b> .....	110	<b>Mining Core, Habirshaw</b> .....	18
Lantern.....	317	Miscellaneous.....	417, 444
Lateral Brackets.....	45	<b>Moisture-proof Insul'n, Shield Brand 6, 9</b> .....	
Lathe, Barnes' Electricians.....	351	"    Sockets.....	215
Learners Telegraph Set.....	441	"    "    Protector.....	222
		Motor Clamp, Stanley.....	282
		Motors, Electric.....	277, 286
		"    Porter Battery.....	286
		Multiple Switch.....	134

ALPHABETICAL INDEX—*Continued.*

<b>N</b>		<b>Page.</b>		<b>Page.</b>	
Nets, Globe .....	372	Pocket Testing Set.....	413	" Tool.....	330
Nippers .....	320	" Wire and Screw Gauges.....	329	" Wrench .....	348
Novelty Bell Hangers Knife.....	323	Pole Counter .....	330	" Hole Augers .....	288
Nozzles and Bushings, Insulating .....	193	" Hole Diggers .....	288	" Indicator, Imhauser's .....	413
" Reducing .....	194	" Pulley, Fletcher's Sleet-proof.....	85	" Ratchet, Wood's.....	425
" Straight and Elbow .....	229	" Steps.....	38	" Step, Removable.....	40
<b>O</b>		" Supporters .....	291	" Work, Terminals for.....	107
Office Wire .....	443	Poles, White Cedar.....	36	Polish, Rod .....	375
Oil Box, Solid .....	362	Polish, Rod .....	375	Porcelain Insulators.....	61, 67
" Can, Perfection.....	311	Portables .....	246, 249	Portable Photometer.....	416
" Crescent.....	360	" Tachometers.....	315	Porter Battery Motors .....	286
" "Helmet" Brand Solid .....	361	Pressure Wire Fuse Holder.....	106	" Wire, Shield Brand .....	8
" Filters .....	146, 147	<b>Primary Fuse Box, Stanley</b> .....	105	Pulley Bl'ks and Eccentric Clamps Comb'd	296
" Paper, Insulating .....	384	" Blocks, Weston's .....	308, 309	" Fletcher's Sleet-proof.....	85, 87
" Syringe .....	311	" Lamp .....	89	Pump, The Gollings.....	150
" Tank, Aztec .....	148	Pump, The Gollings.....	150	Push Buttons .....	436
" Waste Can .....	148	Push Button Socket .....	214	" " Switch .....	191
Oiler, Drip .....	312	<b>R</b>		Raising Forks .....	201
" Sure Feed.....	149	Rapid Transit Arc Switches .....	94	Reducing Nozzles.....	194
Oiling Sets.....	312	Reed-Feed Trolley Hub .....	427	Reels, Pay-out .....	292
Okonite Tape .....	79	Reels, Pay-out .....	292	" Take-up .....	292
<b>P</b>		Reflector Bracket .....	46	" Shades .....	260, 264
P. & B. Armature Varnish .....	82	Regulating Switch, Wirt Lamp .....	190	Regulator, Foot.....	282
" Insulating Compound .....	82	" Wirt Stage.....	274	Resistance Boxes .....	405, 410
" Weather-proof Line Wire .....	10	" Box, Dynamo .....	142	" Box and Wheatstone Bridge .....	405, 406
Paper Shade, Enameled.....	259	" Wire, German Silver .....	381	Rheostat, Wirt.....	141
Paper Shade, Enameled.....	259	Rods, Hard Rubber.....	383		
Pay-out Reels .....	292				
Pendant, Wood's Key Socket .....	211				
Perfection Oil Can .....	311				
Perkins' Incandescent Snap Switch .....	189				
Phonograph Battery .....	433				
Photometer, Portable .....	416				
Pick-Axe .....	290				
Pike Poles.....	290				
Pinch Bar.....	309				
Pin, Fletcher's Insulating .....	48				
" Iron.....	48				
" Wood .....	41				
Pipe Cutters, Rod and.....	350				
" Wrench, Stillson.....	349				
Platinum Wire.....	381				
Pliers, all kinds .....	319, 322				
Plugs, Attachment, all kinds .....	221, 223				
Plug Cut-outs.....	183, 187				
" Safety.....	183				
" Switch .....	185				
Pocket Galvanometer .....	414				

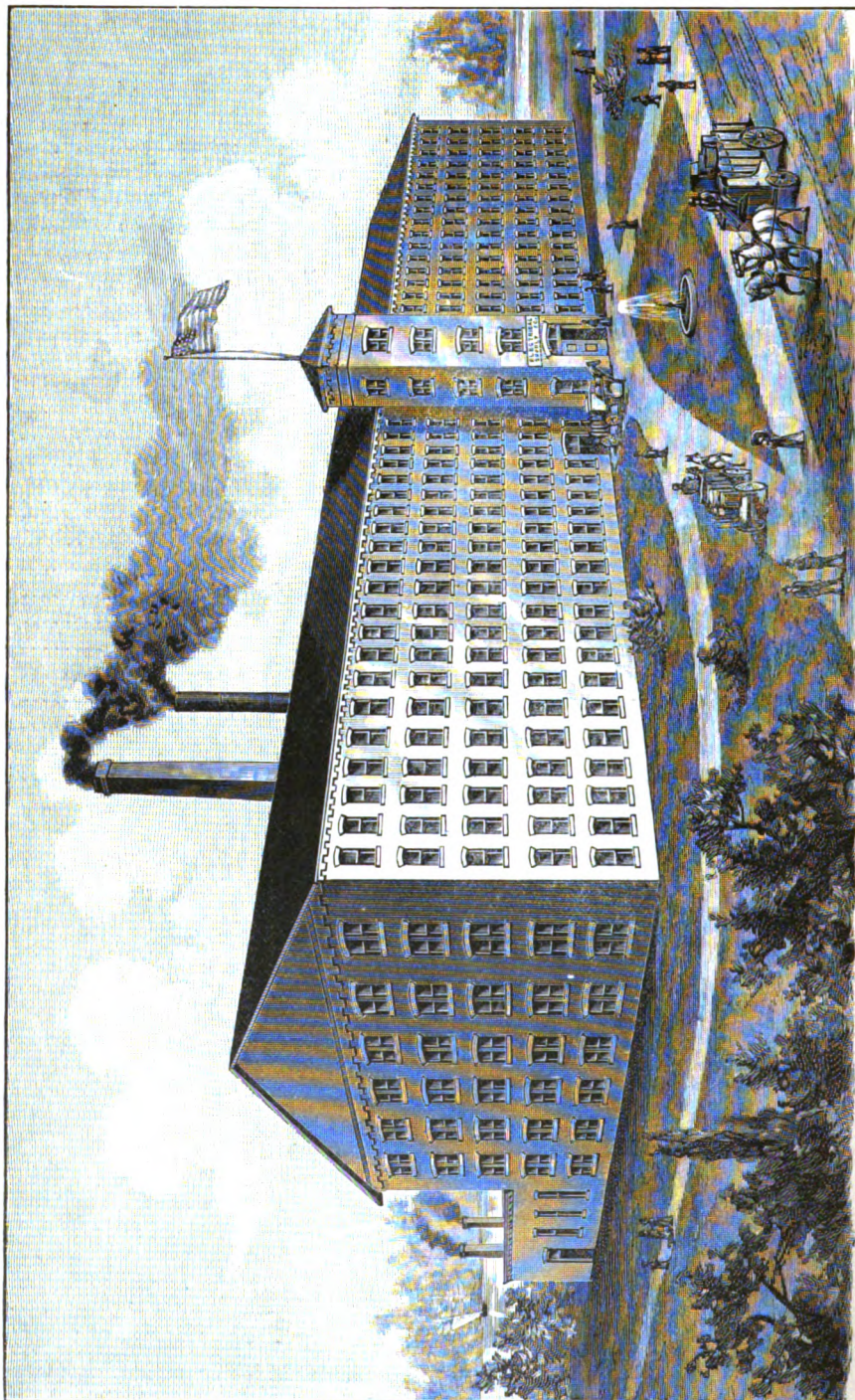
ALPHABETICAL INDEX—*Continued.*

	Page.		Page.
Rod Polish.....	375	Sliding Canopies.....	232
“ Polishing Cloth, Lamp.....	375	Snips, Commutator Brush.....	310
Rolling Mill Gauges.....	329	Sockets, all kinds.....	212, 219
Roof Bracket.....	44	Socket Base.....	219
Rope, Manilla.....	91	“ Handle.....	205
“ “.....	300	“ Hooks.....	209
Rosette and Switch, Wirt Ceiling.....	174	“ Pendant, Wood's.....	211
“ Ceiling.....	170, 171	“ Protector, Moisture-proof.....	222
“ Double Pole Fuse.....	174	“ Safety Attachment.....	205
Rubber Gloves.....	316	Solder.....	368
“ Hook Insulator.....	40	“ Ladies.....	307
“ Insulating Tubing.....	163	Soldering Coppers.....	307
“ Rods, Hard.....	383	“ Furnaces.....	302, 308
“ Sheets, Hard.....	383	“ Lamps, Alcohol.....	306
“ Tape, E. S.....	80	“ Lamp, Incandescent.....	306
“ Tubing, Hard.....	382	“ Salts.....	368
“ Window Tubes.....	112	“ Stove, Portable.....	305
Rules, all kinds.....	346	Span Wire Tightener.....	426
<b>S</b>		Spark Arrester, Arc Lamp.....	118
Saddle Staples, Insulating.....	169	Speed Indicator, all kinds.....	313, 314
Safety Belt.....	318	Splicing Clamps, Conover.....	301
“ Plug.....	183	“ Compound.....	370
“ Wire Tightener.....	39	“ Iron.....	301
Sal Ammoniac.....	444	Spoons.....	288
Saws, all kinds.....	389	Spreader Brackets.....	43
Saw Blades, Hack.....	340	Spring Brass Wire.....	381
Scissors.....	319	Stage Regulator, Wirt.....	274
Screw-Drivers, all kinds.....	323, 326	Standard Cell, Clark.....	410
Sensitive Galvanometer.....	414	“ Portable Testing Sets.....	404
Separable Ball Clusters.....	231	“ Wire Gauges.....	327
Shade, Enameled Paper.....	259	<b>Stanley Fan Motors.....</b>	<b>278, 279</b>
“ Holders.....	196, 198	“ Motor Clamp.....	282
“ Miniature Paper.....	273	“ Primary Fuse Box.....	105
Shades, Aluminum.....	259	“ Sewing Machine Motor.....	280
“ Incandescent Glass.....	250, 256	<b>Stanley Transformers.....</b>	<b>99, 105</b>
“ Reflector.....	260, 264	Staples.....	372
“ Tin.....	257, 258	“ Insulating.....	169
Shears, Commutator Brush.....	310	Stationary Tachometer.....	315
Sheets, Hard Rubber.....	383	Station Equipment Material.....	115, 150
<b>Shield Brand House Wire.....</b>	<b>443</b>	“ Supplies.....	353, 376
<b>Shield Brand Moisture-proof Insul'n.....</b>	<b>6, 9</b>	Stop Cocks, Combination.....	233
“ Splicing Compound.....	81	Storage Battery Changing Switch.....	134
“ Tape.....	81	“ “ Insulator.....	67
Shovels.....	288	Strands for Pole Guys.....	36
Side Bracket.....	46	“ Galvanized Steel Wire.....	90
Silk Machine Wipers.....	374	Strap Switch.....	95, 96
“ Sponge Pads.....	374	Street Fixture, Wirt Incandescent.....	109
Simplex Tree Insulator.....	57	Strip Cut-out.....	178
Sleet-proof Lamp Support, Fletcher's.....	85	Stub's Pliers.....	319
“ Pulleys, Fletcher's.....	85, 86	“ Vise.....	297
		Sulphuric Acid.....	444
		<b>Sunbeam Incandescent Lamps.....</b>	<b>265, 270</b>

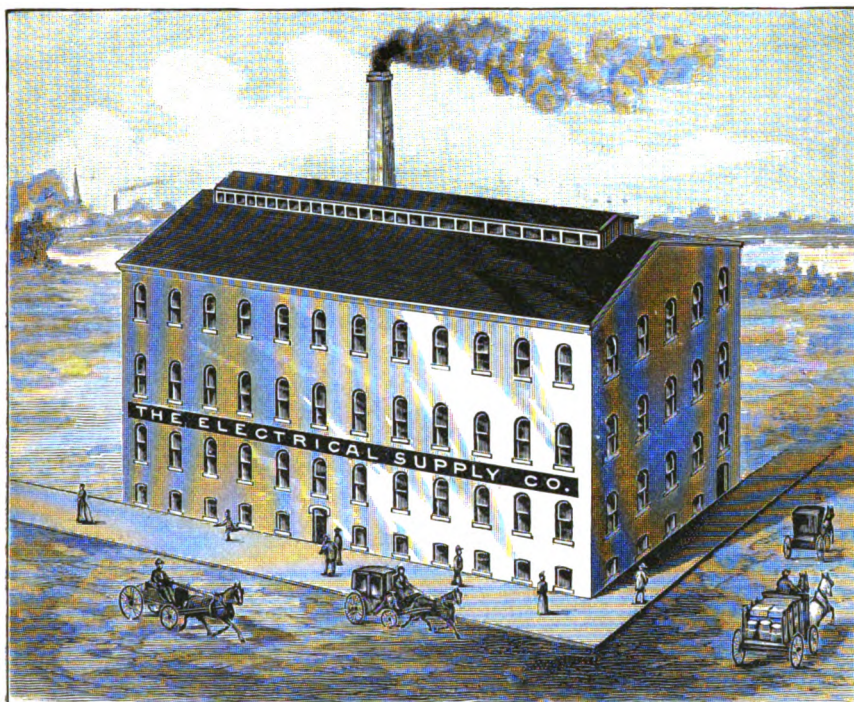


ALPHABETICAL INDEX—*Continued.*

	Page.		Page.
White Light Carbons.....	371	Wirt Incandescent Snap Switch.....	188
Windlass, Fletcher Safety.....	90	“ “ Street Fixture.....	109
Window Tubes, Hard Rubber.....	162	“ Insulating Joints.....	224
Wipers, Silk Machine.....	874	“ Lamp Guard.....	206
Wire Clamp, Jones.....	295	“ “ Regulating Switch.....	190
“ “ Landee.....	295	“ Lightning Arrester.....	108
“ Copper.....	74	“ Portable Ampere Meters.....	394
“ Cutters, Carew's.....	322	“ “ Battery Volt Meter.....	394
“ Ducts, “ Vulca” Electrical.....	160, 161	“ Reliable Fuse Links.....	366
“ Galvanized Steel.....	86	“ Rheostat.....	141
“ Gauges, Standard.....	327	“ Stage Regulator.....	274
“ German Silver Resistance.....	381	“ Standard Volt Meter.....	392
“ Holders, Fletcher's.....	58	“ Universal Shade Holders.....	196
“ “ “.....	163, 164	<b>Wirt Volt Indicator</b> .....	137
“ “ “.....	124, 125	<b>Wirt Volt Indicator</b> .....	399, 400
“ Insulated.....	6, 33	“ Volt Meters.....	392, 393
“ Platinum.....	381	<b>Wood Arc Lamps</b> .....	110
“ Spring Brass.....	381	Wood Cleats.....	165, 168
“ Tightener, Safety.....	89	“ Risers, Fletcher's.....	124
Wiring Pendants, Fletcher's.....	59	Wood's Adjustable Climbers.....	293
<b>Wirt Ampere Indicator</b> .....	138	“ Attachment Plug.....	198
<b>Wirt Ampere Indicator</b> .....	401	“ Duplex Fuse Box.....	176
“ Arc Lamp Insulating Hook.....	84	“ Flexible Cord Connector.....	206
“ Ceiling Rosette.....	171	“ Key Socket Pendant.....	211
“ “ “ and Switch.....	174	“ Lamp Adjuster.....	211
“ Connectors.....	120	“ Pole Ratchet.....	425
<b>Wirt Dynamo Brush</b> .....	354, 355	“ Trolley Catcher.....	428
<b>Wirt Electricity Meter</b> .....	275	“ Universal Desk Clamp.....	210
“ Feeder Switch.....	127	Wrenches, all kinds.....	348, 349
“ Flexible Cord Adjuster.....	204		

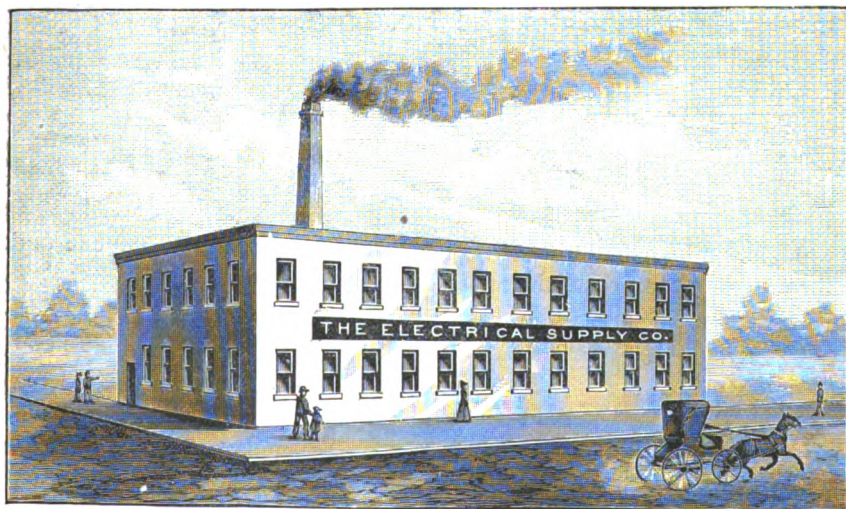


FACTORY AT ANSONIA, CONN.  
FOR THE MANUFACTURE OF INSULATED WIRES AND CABLES.



FACTORY AT ANSONIA, CONN.

FOR THE MANUFACTURE OF ELECTRIC LIGHT AND HOUSE GOODS SUNDRIES.



FACTORY AT CHICAGO.

FOR THE MANUFACTURE OF RAILWAY SPECIALTIES, TESTING INSTRUMENTS, AND SUNDRIES.

## **ELECTRIC RAILWAY DEPARTMENT, No. 3.**

For a complete list of Supplies for Electric Railway Work, see Catalogue No. 31.

## **HOUSE GOODS DEPARTMENT, No. 4.**

For a complete list of Material for Bell and Burglar Alarm Work, Gas Lighting, Hotel Signals, District Messenger Service, Fire Alarm Service, Telegraph Service, College and Experimental Work, see Catalogue No. 44 A.

We will gladly mail a copy of any of our Catalogues to anyone entitled to them upon receipt of business card.











3 2044 049

THE BORROWER WILL BE CHARGED  
AN OVERDUE FEE IF THIS BOOK IS NOT  
RETURNED TO THE LIBRARY ON OR  
BEFORE THE LAST DATE STAMPED  
BELOW. NON-RECEIPT OF OVERDUE  
NOTICES DOES NOT EXEMPT THE  
BORROWER FROM OVERDUE FEES.

WIDENER  
BOOK DUE  
AUG 29 1985  
1031157  
**CANCELLED**  
SEP 12 1985

**CABOT**  
**CANCELLED**  
NOV 17 1982  
SEP 1 1990  
BOOK DUE



3 2044 049 148 232